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Electrical World

The consolidation of Electrical World, Electrical Engineer and American Electrician

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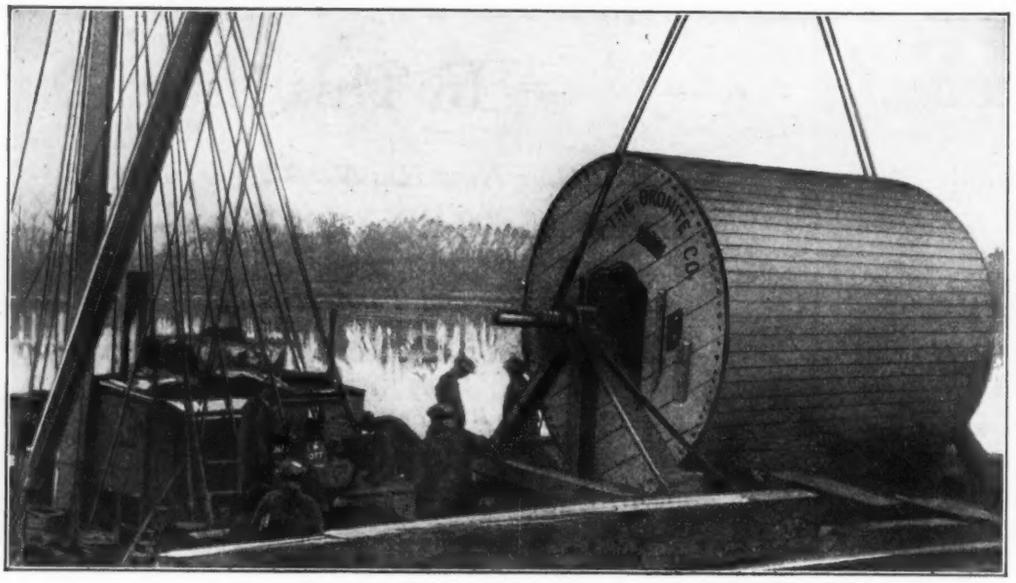
Peru to Providence

SEEING two copies of the Narragansett Electric Company's lighting advertisements reproduced in the ELECTRICAL WORLD, A. Bueno of Lima, Peru, wrote to Providence, R. I., for copies of all available material prepared by this central station to foster better lighting and build good will. He received these promptly and acknowledged them in a letter highly complimentary to the company, stating that the information would be very helpful in case of a similar campaign in Peru.

"Routine coverage," yes; but a pleasing instance of the international value of ELECTRICAL WORLD service.

SUBMARINE POWER CABLE



Quality the only Safeguard

SUBMARINE POWER CABLE is an important specialty of the Okonite Company and the Okonite-Callender Cable Company, Inc.

Long and varied activities in this special field have taught us how to handle the problems peculiar to the production of submarine cables. These underwater cables must give unfailing performance and the purchaser, therefore, has to depend upon his manufacturer for the use of materials of the highest quality and the exercise of the most painstaking care throughout the whole process of manufacture.

The purchaser needs definite, trustworthy recommendations regarding the kind of insulation, armoring, jointing and other details of his particular installation. Advice may be wanted on methods of laying and landing cables, character of the terminal equipment and other features of this vital work.

Inquiries are invited and we are glad to be consulted on the planning of any submarine power cable installations.

OKONITE PRODUCTS
Okonite Insulated Wires and Cables
Okonite Insulating Tape
Okonite Cement
Varnished Cambric Cables
Manson & Dundee Friction Tape
Okocord Okoloom

OKONITE-CALLENDER PRODUCTS
Super-Tension Cables
Impregnated Paper Cables
Splicing Materials

THE OKONITE COMPANY
FOUNDED 1878
THE OKONITE-CALLENDER CABLE COMPANY, INC.
FACTORIES: PASSAIC, N. J. PATERSON, N. J.
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Canadian Representatives: Engineering Materials, Limited, Montreal
Cuban Representatives: Victor G. Mendoza Co., Havana

OKONITE

OKONITE-CALLENDER

Okonite Quality Standards — Unchanged for Half a Century

Electrical World

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Supreme Court Decision on Valuation

WHAT has been termed "the greatest lawsuit in history," involving the St. Louis & O'Fallon Railway and the Interstate Commerce Commission, has been decided in favor of the railroad company by the Supreme Court. The issue involved was that of valuation, and in that, and not in a small and obscure railroad, did interest center. Far-reaching as is the decision on general utility valuation cases and important as it is to those railroads now paying to the government a portion of their earnings in excess of 6 per cent, the court made no new pronouncement, but simply buttressed previous decisions dealing with factors to which consideration must be given in arriving at valuations.

The necessity of actually determining the present cost of reproduction and giving proper weight to it in any final determination of value was the major issue involved, and the Supreme Court found against the Interstate Commerce Commission because its valuation did not give due consideration to reproduction costs along with the other pertinent facts. As a rule, the state commissions have taken a broader view than the federal commissions in determining valuations for rate-making purposes, and the St. Louis & O'Fallon decision indicated that the state commissions, with few exceptions, are following the law and reason. Of course, rate making and valuation, although dependent somewhat on each other, are separate and distinct and should not be confused. Any great increase in steam-railroad passenger or freight rates as a result of the decision is unlikely.

* * * *

Service for Public Health

TO TEACH the American public proper methods of food preservation is the object of a national program now being organized. The work will be concentrated in September, but preliminary work will be done throughout the summer. The N.E.L.A., the N.E.M.A. and other electrical groups are behind the movement and will join other national organizations in a co-operative effort to further it.

Improvement of the public health is a worthy cause, and refrigeration ties directly into the load-building program of the electrical industry. Every incentive exists for utilities and refrigerator manufacturers to teach the public such things as the relationship between food spoilage and public health, the fact that perishable food should be kept at a temperature of 50 degrees or less, the causes from which decay of food and growth of bacteria spring and the vital need for refrigeration throughout the year.

It is planned to use all possible avenues for advertising and promotion to bring the attention of the public to the benefits derived from adequate refrigeration. In each locality the electrical leagues will be instruments for effective work, and a national committee will serve as a clearing house for the campaign.

This program gives the electrical industry an opportunity for public service; it brings to it an opportunity to associate and co-operate with many outside industry groups; it makes possible an educational program that will reflect itself in more business and better public relations. The activity should be supported wholeheartedly by the industry.

* * * *

An Institute of Applied Lighting

LIGHTING is still the bulwark of the electrical business despite the inattention of electrical men. Because electric light has become the standard of America for all buildings of every kind, the thrill has gone out of it. It has become an old story in the family. A large percentage of the income of the power industry comes from the lighting load, but that is one of those unattractive commercial considerations that repel the professional mind, and although the improvement of prevailing lighting practice offers possibilities beyond calculation both for service and for profit, interest turns from it to the newer and more romantic fields of exploration and development. Thus lighting is today universally neglected.

It is for that reason that the opening of the Westinghouse Lighting Institute in New York this week is of such national interest. For it is not a lighting school. It is not a scientific laboratory. It is a permanent institute of applied lighting. It is a dramatic demonstration of the scope of the modern lighting art—yes, but that is incidental. The real purpose is to reproduce the highest standards of illumination for all applications, not by models or illusions, but life-size. And the scale on which this has been carried out dwarfs any previous conception. The most sophisticated electrical man is stirred to enthusiasm as he recognizes the vision, the courage, the artistry and the money that have been poured into this project.

The institute occupies a floor in the Grand Central Palace. One enters a city street apparently a full block long. Built along it are a factory, a gas station and garage, a theater, a home, a department store, a power company salesroom, a contractor-dealer's store, an office, an art gallery, a schoolroom and so on. Each is full-size, completely equipped and a working demonstration of various methods of lighting. It involves probably the most elaborate installation of wiring that has ever been attempted. It combines a delightful expression of decorative illumination in the foyer and reception hall

with a complete exhibition of utility in lighting. Even the floodlighting of skyscrapers and airports is cleverly accomplished—these, of course, in miniature. And the exhibits will change in step with the advancing progress of illumination.

This is high praise—but it is merited. The Westinghouse Lighting Institute is a splendid contribution to the educational equipment of the industry. It will draw countless visitors from the ranks of the electrical and building industries and from the public. It should awaken and arouse thousands of men now apathetic toward lighting to the fact that here lies not only a tremendous undeveloped market but an opportunity for public service that no other field can challenge.

* * * *

Rapid Growth of the N.E.M.A.

THE electrical manufacturers have developed their organization and now have a mechanism for doing things. This was indicated at the N.E.M.A. meeting at Hot Springs, Va., last week, where it was reported that in three years this organization has grown to large proportions and that during the past year it expanded from nineteen to twenty-eight sections. This growth indicates that it meets a need of the manufacturers and affords them an agency for co-operative work.

During the next few years the N.E.M.A. will face its most critical period because it must develop a method of doing business on a large scale and must instill into individual members confidence in the executive group that directs its policies. This is a difficult task when it is remembered that each of the twenty-eight sections is made up of a group of competing manufacturers and when the wide diversity of interest in section activities is considered. Small and large manufacturers exist and each of them has traditions and policies. Many manufacturers are impatient with progress or expect their own ideas to rule. Other manufacturers are apt to distrust the motives and criticise the practices of their associates. Beyond these petty elements lies an uncharted realm in which the things a trade association can do or should do are not outlined.

There is no doubt that the N.E.M.A. has a splendid record to date and has a big future before it. It starts with a program of personal confidence in the constructive purposes of its members and builds its work on the basis of fact finding, uniform cost accounting, standardization and good trade practices. It has an educational job to do, and it will make progress according to the degree in which the members trust one another and co-operate with one another on those matters that will build up the manufacturing industry. The cards must be on the table at all times, and the individual members must be consulted and kept at work for the benefit of the association.

A co-operative group of manufacturers can do much to help build the industry in a broad way. To the N.E.M.A. and N.E.L.A. the industry can look for leadership and co-operation that will unite all electrical groups for common purposes. The food preservation work, the "Golden Jubilee of Light," code activities, standardization and many other projects depend upon organized industry groups for motivation. In this work the N.E.M.A. has taken an active part, and, as was brought out at Hot Springs, its leaders look forward to still larger opportunities for co-operative work in the future. All that is required in order to insure steady progress toward the goals set up by the N.E.M.A. organization committee is wise leadership and mutual trust. The mechanism is perfected, and it should now function efficiently if the members keep faith.

* * * *

Auxiliary Power Supply in Hydro-Electric Plants

HYDRO-ELECTRIC plants are generally remote from the load. Seldom are customers near enough to the generating station to be furnished with energy at low tension. Because the majority of the generated energy is sent out over high-tension lines there is little reason for the considerable expenditure which would be involved in establishing low-tension switching and bus work at generator voltage, now chiefly 13,200. The only switching required would be that on the high side of the transformers and in the high-tension lines. However, a certain amount of energy is required for supplying the auxiliaries in the power house, and the methods for taking care of these auxiliaries have not been sufficiently discussed.

While the auxiliaries in a hydro plant are not so important as those in a steam plant, still they must be taken care of. All the methods employed in steam plants to make sure of a continuous supply for auxiliaries, such as shaft generators, house turbines, transformers stepping down from the high tension or transformers stepping down from the generators, seem too expensive for a hydro plant, even though many a hydro plant contains one or the other of these extravagant installations. The most essential auxiliaries in a hydro plant are oil pumps, air pumps, emergency gate operation and station lighting. Other auxiliaries, such as normal gate drives or the station crane, are used only at infrequent intervals. Continuity of service for these auxiliaries is of secondary importance; yet there must be a supply of energy to take care of this load.

One of the simplest ways of serving hydro-plant auxiliaries would be to make the directly connected exciters sufficiently large to carry this additional load, providing two sets of exciter buses if necessary for voltage regulation. A small amount of power must be available to raise oil pressure for governor operation before the first wheel is turned over and also for emergency gate operation. This small but very important item has given station designers a great deal of worry. In the old types of power houses one or two small waterwheel exciters were generally provided. On very high-head developments it is occasionally possible to provide a tap for a small impulse-type wheel at comparatively small expense, but in most large developments this would not seem practicable. Storage batteries have been used in some cases and have been suggested in others. But a storage battery for this purpose would have to be of considerable size in comparison with the ordinary control battery and would generally have to supply 250 volts instead of 125 volts—a rather unpracticable proposal for a service which has to be performed only on very rare occasions.

By far the best method is to provide a small gasoline or oil engine driving a spare exciter. Such an engine could be used very profitably as a source of energy during construction, and when the construction is finished it could, when the plant is shut down, furnish energy for the crane and station lighting, could operate the first pump to get up oil pressure, open the first gate and then

be shut down and kept ready for the next emergency. Such an engine could even be arranged to start automatically when all other sources of energy fail.

* * * *

Industrial Heating Advertising Becomes Necessary

THROUGH continuous effort the electrical industry is doing what may be said to be a fair job in the field of industrial electric heating. Efforts have been sporadic and results "spotty," but the industry, generally speaking, is now really alive to the great possibilities of this field. However, central-station companies and manufacturers and their agents interested in promoting industrial electric heating will be wise not to overlook the intensive drive that is being made by the gas industry to meet electric competition and save industrial heating for the gas companies.

There is one thing that the gas industry is doing through its national association after which the electrical industry could well afford to pattern. This is a nation-wide advertising compaign, conducted not alone through the gas industry's own trade papers but through journals of a particular trade or industry that reach the user of industrial heat. In other words, the gas men do not talk among themselves, as the electrical industry has been prone to do, but carry their message directly to the user or potential user of their product.

It would be a mistake for electrical men to lull themselves into complacency by thinking that the gas business is on its last legs. It is more active than ever before in its history, and the electrical industry could well afford to appropriate money for national advertising for the purpose of carrying its message, too, directly to the user of industrial heating equipment. This the industry owes to the men out on the firing line who are battling to break down the competition of fuels and place industrial electric heat in the position that rightfully should be its.

* * * *

Buy and Don't Be Sold

MODERN business men have come to the conclusion that it is better to buy than to be sold. Realizing this, the utility industry should grant purchasing departments equal rank with sales, production, engineering and accounting divisions. The importance of purchasing is indicated by the fact that on most utilities about two dollars is spent for materials for every dollar spent for labor, overhead and engineering. In order to buy instead of being sold, the purchasing department must be organized, must have executive support and must be manned with competent buyers.

It is not the function of purchasing to select; rather it should suggest, question and arrange the business details of purchasing. In the utility industry this means that there should be full co-operation between the purchasing and engineering departments so that the suggestions and questions of the purchasers can be utilized in placing an order to best advantage. It is also necessary to arm the purchasers with general market data, with past prices, with costs of materials and with a knowledge of general manufacturing situations so that they may be prepared to bring an informed judgment to bear on any situation encountered.

Price is one of the minor elements of purchasing, if it be defined as the best ultimate value. The effort of the skilled purchaser is to buy the "right quality at the right time with the best service at the right price." To do this he must be a business man in the broad sense of the word and not a catalog buyer. Nor does this mean bartering and dickering; on the contrary, it means that the purchaser can arrive at an independent estimate, not only of a fair price but of the relative abilities of manufacturers to fill the order. Competent purchasing should stabilize prices and place buying and selling on a business plane that shifts only with the law of supply and demand as affected by productive capacity and market absorption.

To informed purchasing add accurate manufacturing statistics and a little faith in human honesty and the receipt is had for stabilized relations between buyers and sellers in the electrical industry.

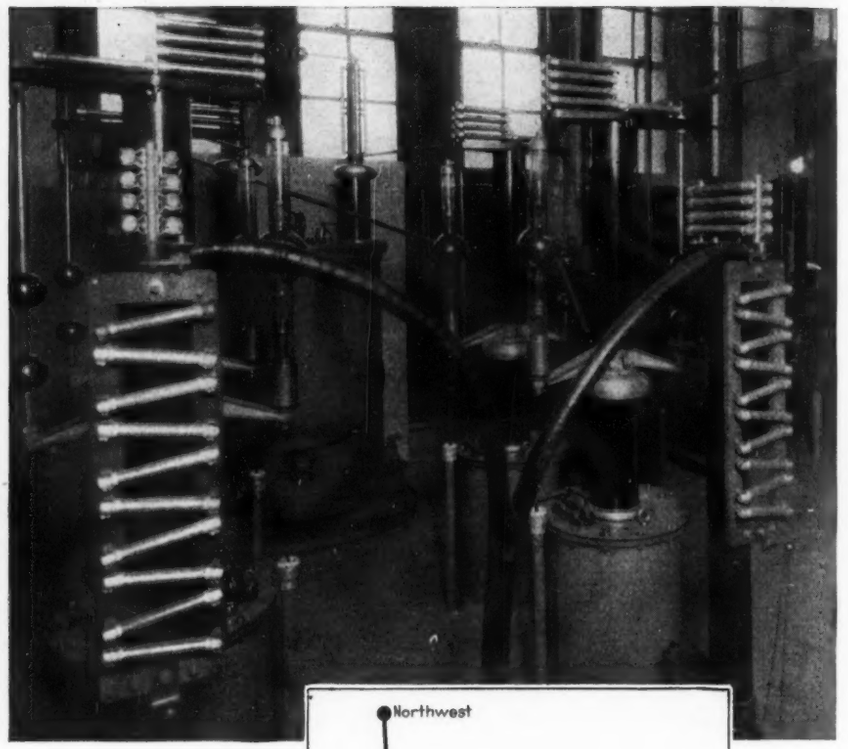
* * * *

Alternating-Current and Direct-Current Tests of Insulation

THE increasing values of voltage for underground power cables necessitates correspondingly increased facilities for the testing of their dielectric strength. This means that, owing to increased values of capacity charging currents, the kva. capacity of testing sets becomes a limiting factor. The problem is an old one, but is especially emphasized in cable insulation by reason of the high values of electrostatic capacity associated with a long length of cable. The suggestion has been made that the tests in question be made with continuous voltage, and, as is well known, combined transformer and rectifying equipments are available for this purpose. The difficulty so far, however, has been in the uncertainty of the proper value of continuous voltage to be used. Comparative studies have been made of the relative performance of insulation under alternating and continuous stress. The results, however, have not been sufficiently definite or extensive to warrant a standard ratio, and the matter is still undetermined.

It appears doubtful whether a definite standard ratio between alternating-current and direct-current voltages will be possible. There are essential fundamental differences in the behavior of insulation under continuous and alternating stress. In the former virtually no energy is liberated in the wall of the insulation, whereas in the alternating case there are dielectric losses which may be of considerable magnitude. If a definite type of specimen for test could be adopted, it is possible that a reasonably fixed ratio as between alternating-current and direct-current tests could be derived, but this simple case is rarely, if ever, approached in practice. The insulation for different types of machines or cables differs widely, and the conditions of energy dissipation and internal temperature distribution become highly disturbing factors. The question of frequency is also necessarily involved. As a result of these things it scarcely appears possible to establish a fixed relationship between alternating-current and direct-current tests for dielectric strength. The nearest thing that may be hoped for would be a series of ratios pertaining to different thicknesses of wall, types of material, surrounding temperature gradient and subsequent operating frequencies. If we add to these the results of the well-known variation in the quality of the most carefully prepared insulation, it would appear that we have little to hope for in the substitution of direct-current for alternating-current breakdown tests.

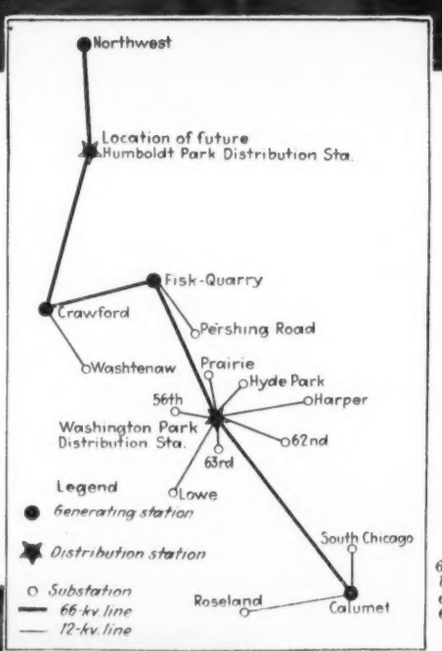
Chicago's Bulk-Supply Substation



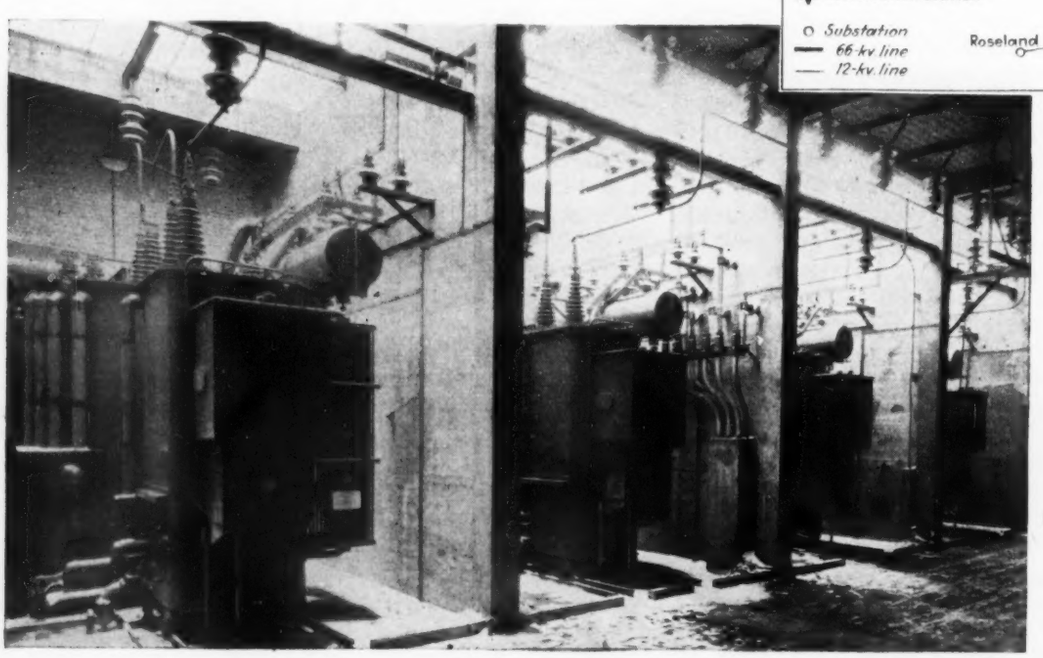
Kenotron set for testing incoming and outgoing cables

TO SERVE its territory, where the load is already dense and will be denser, the Commonwealth Edison Company has developed its system on the basis of a 66-kv. bus from one end of the area to the other. This joins all generating stations between Northwest on the north and Calumet on the south and passes through an intermediate bulk-supply substation recently completed at Washington Park. Provision is made for another intermediate bulk-supply substation at Humboldt Park.

Washington Park substation, which now has 120,000 kva. installed, is served by three 66-kv. lines and supplies sixteen 12-kv. feeders to distribution substations. An addition now under construction will raise the capacity to 180,000 kva. and will accommodate three more 66-kv. lines and eight 12-kv. feeders.



66-kv. bus crosses Chicago



Six 20,000-kva., 66-kv./12-kv. tap-changing transformers in Washington Park substation; 7,500-kva. tertiary windings supply local distribution at 4,000 volts

Latest 165,000-Kw. Unit

Gives Hell Gate 600,000 Kw.

Generates at 13,800 volts. Shaft exciters and auxiliary generators. Special support of cylinder, stainless steel and manganese bronze blades with special mounting. Flexibility of steam lines, direct-driven oil impeller and other features

THE Hell Gate station of the United Electric Light & Power Company of New York has attained the position of the world's largest power plant by the placing in service of a two-cylinder cross-compound turbo-generator unit rated at 165,000 kw. capacity. The total capacity of the station is now in excess of 600,000 kw. Both elements of this unit operate at 1,800 r.p.m.

The high-pressure turbine drives a 94,200-kva., 13,800-volt generator to which are directly connected two 200-kw., 250-volt main generator exciters. The low-pressure turbine drives another 94,200-kva. generator, a 6,250-kva., 2,400-volt house-current generator and a 50-kw. auxiliary generator exciter. The two main generators are side by side and are inclosed in a common sheet-metal casing or duct through which 275,000 cu.ft. of air is circulated per minute by three propeller-type blowers situated midway between the two generators.

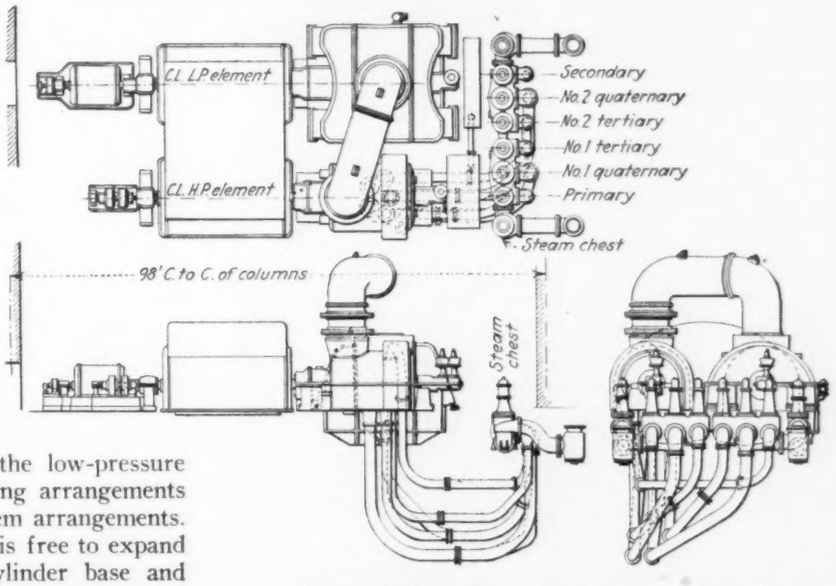
Steam is delivered to the high-pressure turbine at 265 lb. gage and 290 deg. F. superheat. Provision is made for progressive heating of the feed water in four stages.

More than mere capacity characterizes this installation. Among the features are the method of supporting the turbine cylinder parts, the design of the low-pressure blading, the steam chest and inlet piping arrangements and the governing and lubricating system arrangements.

The high-pressure cylinder structure is free to expand without restriction. It consists of cylinder base and cover, each made in two parts—a high-pressure and a low-pressure end—which are bolted together during construction and thereafter treated as one piece. The cylinder is supported on four lugs, which are free to slide on machined surfaces. The coupling-end-bearing pedestal is bolted securely to the foundation to form the anchor point for the structure. The cylinder is secured in place axially by struts connecting it to the coupling-end-bearing pedestal, these struts having sufficient flexibility in a lateral direction to take care of lateral differential expansion between the pedestal and cylinder parts. Sidewise displacement of the turbine center line is prevented by a key on the cylinder between guides on the pedestal structure.

The thrust-end-bearing pedestal is likewise bolted solidly to the foundation and carries the machined surfaces upon which the cylinder lugs slide. The thrust-end turbine bearing and thrust bearing are carried in a separate housing which will slide on the pedestal. The cylinder is tied to this thrust-bearing housing by long strut bolts. Keys between the cylinder and the thrust-end-bearing pedestal and between the cylinder and the thrust-bearing housing prevent side motion or displacement of the center line.

The low-pressure turbine cylinder consists of base and cover, each made in three parts and inclosing a loose blade ring which carries all the stationary blading except the last row of guide vanes at either end. The cylinder is anchored at the coupling-end-bearing pedestal and is supported on four chairs, each of which is free to expand



Two 94,200-Kva. Cross-Compound Turbines Compose New Unit

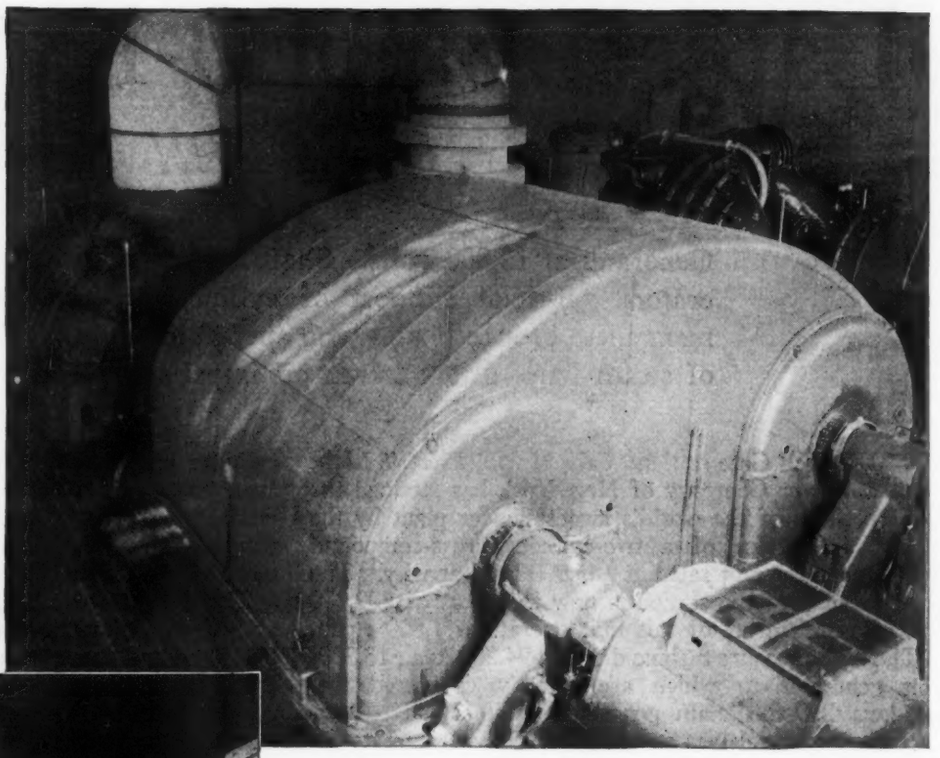
laterally or axially. Lateral disturbance of the center line is prevented by keys which center the cylinder part on the foundation.

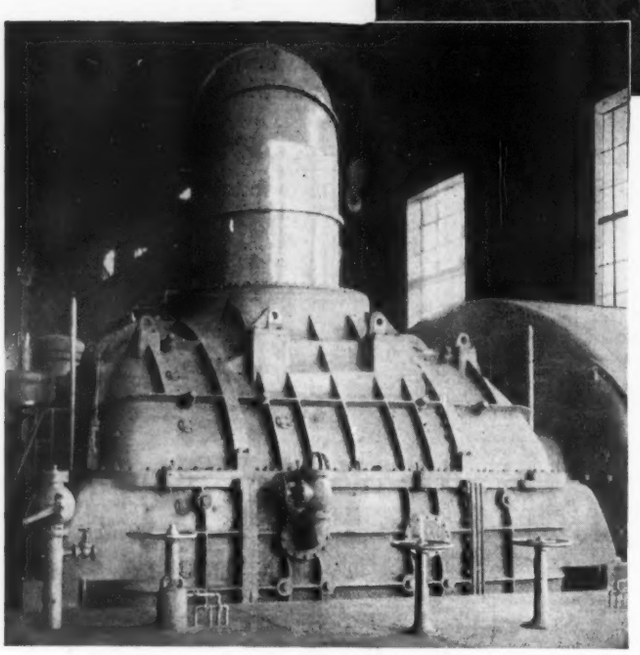
The rotating blades throughout the turbine, both high pressure and low pressure, are made of stainless steel, and the cylinder or stationary blading is of stainless steel as well, except for the last rows of guide vanes in the low-pressure cylinder, the final row being made of cast iron, the two preceding rows of cast manganese bronze.

All the spindle blades, except the last three rows at either end of the double-flow low-pressure spindle, are fastened with a T-head fastening which has been in use for some years past with highly satisfactory results. The last three rows at either end of the low-pressure turbine are secured with a new type of fastening. These blades

188,400-Kva. Unit Just Started in New York

The generators have completely electrically welded stators, low loss punchings in magnetic circuits, unusual ventilation and removable frame feet.





have a curved serrated root, the serration taking the form of a buttressed thread, and instead of being entered in a circumferential groove in the customary manner they are entered axially into grooves machined across the periphery of the blade disk.

Each blade as it is entered in the groove comes solidly into contact with the preceding blade and the radii of curvature of the root surfaces are so chosen that each blade in turn locks in place the one preceding it. The last blade to be inserted must, of course, be hand fitted and the blades are then further secured against side movement by rolling over a projecting portion of the root into a groove machined in the disk.

Although at the time this order was placed the Westinghouse company had already developed the so-called impeller type oil governor, the engineers of the United Electric Light & Power Company, because of the excellent regulating characteristics of the older fly-ball governor and perhaps with a view to station uniformity, preferred to have this type of governor.

Six inlet valves, arranged in two groups, control the admission of steam to the high-pressure turbine. These valves are arranged to open in four steps. One primary valve and one secondary valve each admits steam to a nozzle group in the impulse element. For the tertiary load two valves open together and admit steam to the impulse wheel chamber, by-passing the impulse element. This combination will carry loads up to 120,000 kw. For the maximum load of 165,000 kw. the fifth and sixth valves open together, admitting steam between the first and second reaction blade groups. Each of these valves is actuated by an independent operating piston controlled by an individual relay. These relays in turn are cam-actuated from a main operating piston controlled by the main governor relay.

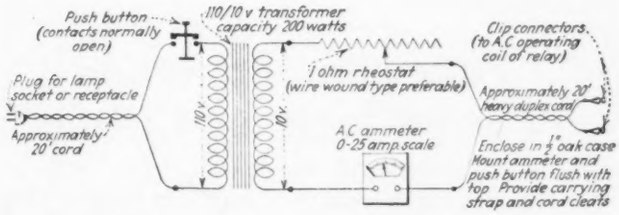
The main oil pump, instead of being of the usual vertical gear or rotary type, driven from the turbine shaft by means of a worm and gear, is a centrifugal impeller mounted directly on the main turbine shaft. A practicable and satisfactory combination of this kind was achieved by employing part of the oil discharge from the impeller as motive fluid in an oil ejector. This ejector raises from the reservoir a large quantity of oil at low pressure and delivers it under a small positive head to the impeller inlet chamber. Since an auxiliary oil pump must be used in any case during starting and stopping, when the speed of the main oil pump is too low to produce the required pressure, this system provides a compact and self-contained lubricating arrangement in which the only moving element is an ordinary centrifugal pump runner.

Connection is made from the steam chest to the high-pressure turbine by means of a number of long, relatively flexible pipe loops underneath the floor level. The effect on the turbine of temperature changes is further minimized by making the inlet loops of such length that in the initial cold condition the high-pressure turbine will be subjected to a contraction strain, thus approximately halving the value of the ultimate expansion strain at maximum temperature.

Relay Testing Device for Field Use

By B. N. Merritt
Assistant Load Dispatcher
Pacific Gas & Electric Company, San Francisco, Calif.

ONE of the problems in modern relay practice on alternating-current systems is quick, easy and reliable testing of over-current relays of all types. This is particularly true of large systems with widely scattered stations. It is the general custom with most operating


Push button (contacts normally open)
110/10 v transformer capacity 200 watts
Clip connectors (to A.C. operating coil of relay)
Plug for lamp socket or receptacle
1 ohm rheostat (wire wound type preferable)
Approximately 20' heavy duplex cord
110 v
10 v
A.C. ammeter 0-25 amp. scale
Approximately 20' cord
Enclose in 1" oak case Mount ammeter and push button flush with top. Provide carrying strap and cord cleats

Device Furnishes 5 to 25 Amp. at 10 Volts for Testing Relays

companies to conduct a thorough check on all new relay installations and then depend for further routine testing upon the local maintenance organizations. However, it often occurs that special tests must be made on short notice, and a trained test man may not be immediately available. In these cases, in order to be certain that the direct-current tripping circuit from relay contacts to breakers is complete, the station operator or foreman removes the relay covers and manually closes the relay contacts. In many instances this practice results in changed adjustments, and at the best it proves nothing beyond the direct-current circuit to the breaker.

There has recently been developed by the Pacific Gas & Electric Company a compact and inexpensive testing device that may be used by any station operator or workman without fear of damage to relay or test set. As shown in the accompanying diagram, this device is very similar to that used in shop tests of watt-hour meters, with the addition of an ammeter. It may be used on any type of alternating-current over-current relay without removing the relay cover or disconnecting the relay from any part of its alternating-current or direct-current circuit. The device now in use will deliver from 5 to 25 amp. at approximately 10 volts through the alternating-current operating coil of the relay, depending on the adjustment of the rheostat and the tap setting of the relay. This is ample to insure reasonably fast operation of any standard alternating-current over-current relay with tap ratings of from ½ to 12 amp.

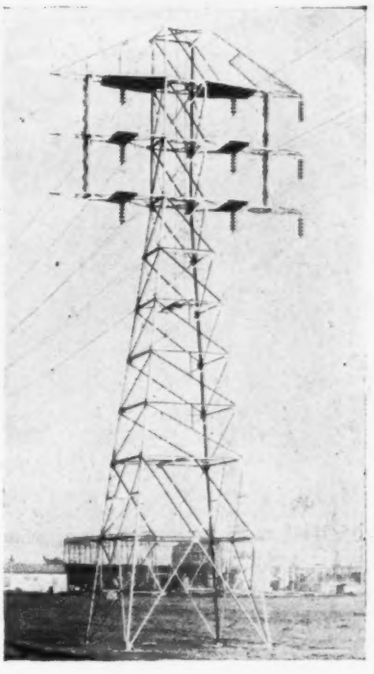
This method of emergency testing not only avoids the possibility of damage to or changed adjustment of relays, but proves that the relay is in operating condition and provides a reasonably accurate check on its current-time setting. The use of this device, which is inexpensive enough to permit of units being furnished as part of station equipment, will reduce the necessary routine tests by trained men to a minimum and result in a very considerable saving on any system using a large number of alternating-current over-current relays for protective purposes.

As used by this company, the complete testing unit can be assembled and cased at a cost of from $15 to $30, depending on the type of parts used. A number of standard meter testing sets, ranging in price from $30 to $75, were tried out, but due to the difference in relay characteristics they were found unsuitable for the work.

Four-Circuit Towers Conserve Right-of-Way Space

By C. B. Carlson
Structural Designing Engineer
Southern California Edison Company, Los Angeles, Calif.

RAPID industrial growth demanding large blocks of power, coupled with the rapidly increasing costs of property for rights-of-way for transmission lines, necessitated grouping circuits into the minimum space. The Southern California Edison Company has already used towers supporting from six to fourteen circuits of 66 kv. and to support four circuits a single tower was designed, completing all possible combinations in multi-circuit requirements. Circuits are 10 ft. apart horizontally and 8 ft. vertically. The inside circuits are 6 ft. each side of a 6-ft. basket, making a 36-ft. over-all crossarm. The top crossarm provides a walkway to hatches which by use of individual ladders lead to the circuit requiring attention. Circuits are plainly marked and it is impossible to get from one to another without returning to the top crossarm and entering the hatch leading to that circuit.



Walk-way and Ladders Protect Workmen

The tower is 83 ft. over all with 60 ft. to lower crossarm, allowing the use of No. 4/0 copper stressed to 3,200 lb. under maximum tension conditions, with spans up to 850 ft. The design provides for a suspension tower, an angle anchor tower for angles up to 45 deg. and a 90-deg. angle anchor tower. The tower is made of high elastic limit steel galvanized by hot dip process and is erected with galvanized bolts. The weight of the suspension tower, including steel earth footings, is 15,500 lb., which is more economical than the use of two double circuit towers of equal strength and height.

By obtaining private rights-of-way for permanent transmission lines, the expense incidental to street widening, contact with vehicular traffic, decay and necessary replacement of wood-pole lines is avoided. It is therefore of interest to remove wood-pole lines along streets where transmission alone is concerned and develop the economical and permanent multi-circuit steel structures for combinations of four, six, eight, twelve and fourteen circuits.

Portable Meter Rack

By L. C. Roberts
Meter Supervisor Staten Island Edison Division, Associated Gas & Electric System

TO INCREASE the efficiency of handling watt-hour meters in its laboratory and stockroom the Staten Island Edison Company has adopted portable meter racks having a capacity of 100 meters each.

These racks are light in weight, being built on the principle of reinforced frame work. The face on which the meters are hung is laminated wood ($\frac{3}{8}$-in. material) covered with sheet metal. The screws for supporting the meters are centered on $\frac{1}{2}$-in. furring strips on the back of each face. The entire assembly is braced against side sway under load and twisting stresses when in motion. Only 15 sq.ft. of floor space is required for 100 meters

Affords Speedy, Silent Transportation for 100 Meters

All sorts of floor conditions had to be encountered so the wheels as well as the swivels are mounted on roller bearings. The wheel itself is made of canvas strips assembled and mounted under hydraulic pressure. The assembly is such that biased edges form the rolling surface. In use, it has been found difficult, if not impossible, to slide the wheels on any surface, such as concrete, metal or in any wet spots.

For handling incoming and outgoing meters to the point of truck loading the advantage of such equipment is self-evident. Particularly for new meters just received is its use especially beneficial. A shipment of meters can be opened at any point, the meters hung on the truck and moved to the meter department for numbering, test and storage. For example, after numbers have been assigned, without moving the meters from their place on the truck, it can be moved directly to the test bench. Here the tester has only to turn in his tracks to obtain his next meter, and similarly when the test is completed It is then a simple matter to move the truck, with all meters tested, to storage and proceed with the next truck.

A distinct advantage of this type of truck for transportation and handling over the other types, such as fixed racks, shelf storage and trucks and fixed carrier systems, is plainly apparent. The fixed racks and carrier systems clearly lack flexibility and are difficult to handle when natural growth requires an increase in facilities. Racks are usually built to extend from ceiling to floor and require ladders for the top rows. No such inconvenience or hazards are present with the type illustrated. Shelves shelf trucks, while more flexible, are at a disadvantage because the meter is not plainly visible. These portable trucks have none of these disadvantages, and with them there is a tendency to cut down the quantity in stock, as meters can be kept in a more mobile condition.

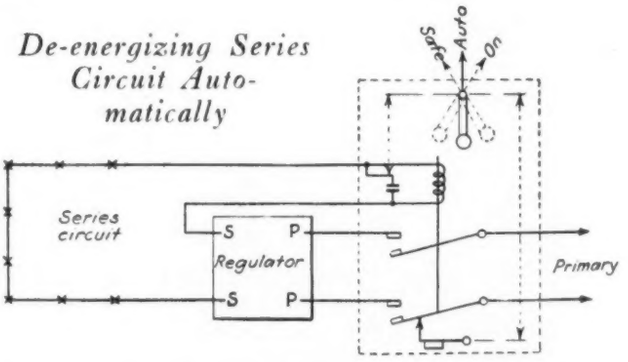
Automatic Protection of Series Lighting Circuits

By W. M. Craven
District Superintendent Alabama Power Company

SINCE the open circuit voltage of series lighting transformers is generally of such an order as to be dangerous, the accidental breakage of a line wire serving as a part of a series circuit constitutes hazard if energized. But this hazard can be practically eliminated by the use of an oil circuit breaker on the primary side of the constant current transformer, provided a series control coil is used and energized by the current in the series circuit. Slight changes are necessary in some of the switches equipped with series control coils to adapt them to the type of control illustrated in the accompanying diagram.

The primary circuit is closed by moving the operating handle to the "on" position manually, thus closing the oil switch mechanically. The levers are so weighted that the control handle moves back to the middle or automatic position by gravity. As soon as the primary is energized the constant current from the secondary passes through the holding coil and holds the breaker closed. It is evident that the moment the secondary current dies down, as in the case of a wire break, the oil switch drops open instantly, thereby de-energizing the falling wire before it strikes the ground. In the "safe" position an insulating rod closes a contact which short circuits the holding coil. The operating lever is arranged to latch in this position.

De-energizing Series Circuit Automatically



This type of control is of service only where series circuits are operated manually. A switch somewhat similar to the above is manufactured by the General Electric Company for use in connection with an auxiliary relay so arranged as to give this same protection to remote-controlled circuits.

Performance and Tendencies of

High-Tension Cable

Analysis of failures discloses that improvements in operating practices will better cable performance. Recent changes in design and manufacture. Increasing use of single-conductor and oil-filled cable

By HERMAN HALPERIN

Head Engineer Technical Division,
Street Department, Commonwealth Edison Company, Chicago, Ill.

DURING the past seven years the maximum operating pressure of underground cable in the United States has increased from 26,400 to 132,000 volts, the amount of high-tension cable in use has more than doubled and very important changes and improvements in the art have been made. In the light of these developments it is intended to discuss the past and present aspects of high-tension underground operation, using as a basis the information that the author has available as chairman of the N.E.L.A. subcommittee on cable operation (underground systems committee) and as a result of his employment in the Commonwealth Edison Company.

A summary of the operating data on high-tension underground lines in the United States is shown in Figs. 1 to 5, inclusive. Although the total rate of cable and joint failures has recently decreased to twelve per 100 miles per year, the rate is still very high. Even though a considerable portion of the failures are ascribed to defective cable and materials and design of joints, the majority of them are due to causes which are within the jurisdiction of the utility companies. Both the manufacturing and operating companies have shown considerable progress, as indicated by the reduction of failures in cables and joints made in the past few years, but the possibilities for further improvements are still large.

The causes of cable failures may be divided into three general classifications, as follows:

(a) Inherent causes, which arise from defects in the cable as manufactured (usually in the insulation) or defects which develop by weakening of the insulation due to deterioration of the physical and insulating properties during normal service.

(b) Non-inherent causes, which include mechanical injury during installation or operation, corrosion, overloading, sheath cracks, mechanical injury by outside agencies, etc.

(c) Unknown causes, which include cases of apparently normal insulation with no discernible indication of external injury.

CABLE FAILURES DUE TO CAUSES INHERENT IN THE CABLE

In the cables made ten or more years ago the insulation usually consisted of manila paper impregnated with a mixture of rosin and rosin oil. As indicated in numerous articles, especially in the *Journal* of the A.I.E.E. during the period from 1917 to 1922, it was found that there were losses in the dielectric which greatly reduced the carrying capacity of the cables. The power factors of the charging currents were from 20 to 60 per cent at the maximum allowable conductor temperature, with a resultant decrease in the carrying capacity of from 5 to 25 per cent. The actual losses, for instance, on a three-conductor, belted type, 12-kv. cable at 73 deg. C. were from one to three watts per foot of cable. As these high losses resulted in severe economic penalties in cable operation, the impregnating compounds were changed to those which would result in considerably lower dielectric losses. The newer compounds had a mineral base with little or no rosin present. It was found, however, that the new compounds would not give as uniform

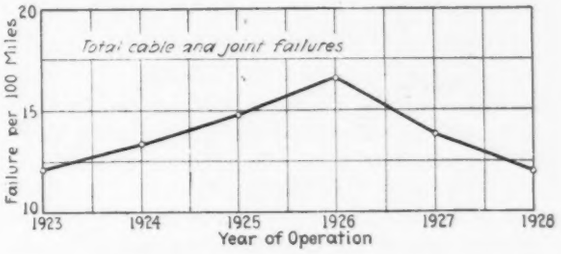


Fig. 1—Total Cable and Joint Failures per 100 Miles

The above data on cable rated at 6,600 volts and above and other data in this article are taken from the reports of the N.E.L.A. subcommittee on cable operation (underground systems committee).

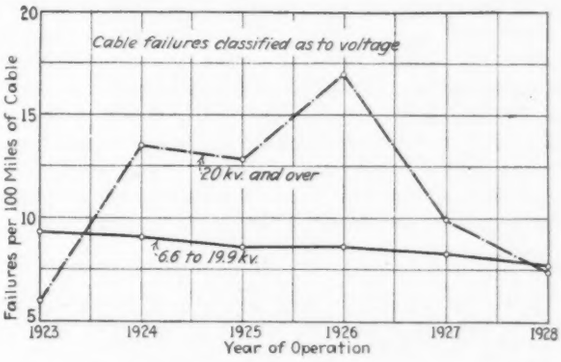


Fig. 2—Failures Classified According to Operating Voltage

The large increase in the rate of failures in cables rated at 20 kv. and over has been principally due to the decrease in failures due to inherent causes. For the lower voltages there has been only a slight decrease in the curve on account of the predominance of troubles due to non-inherent causes.

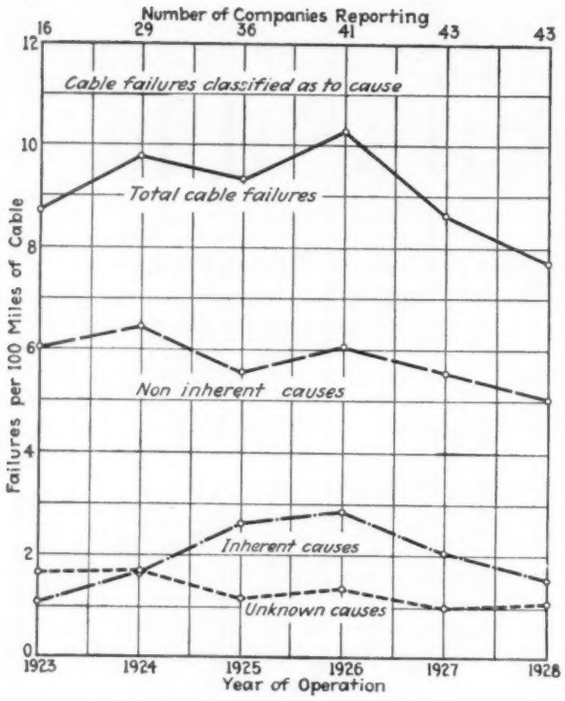


Fig. 3—Failures in High-Tension Cable Classified as to Cause

impregnation of the paper as the old rosin compound. Furthermore, the mineral compounds were not stable, but would change into a wax-like substance. Coincident with, or following, this change, slow carbonization frequently took place in the insulation and these deteriorations in the quality of the insulation resulted in a high rate of cable failures, especially those operating over 20 kv., during the period 1924 to 1926.

As experience in the use of the mineral compounds was gained and extensive research work was conducted more suitable compounds were selected and better methods of manufacture were used. The dielectric strength of new cable rose rapidly. The per cent of manufactured cable which failed to meet the requirements of the specifications steadily decreased in spite of the fact that those requirements were made much more rigid. Also, improvements were made in installation and operation, as will be discussed later. These improvements were reflected in the improved operating records for 1927 and 1928 as indicated by the following:

1. A considerable decrease occurred in total rate of failures in cables at 20 kv. and over (Fig. 2).
2. The rate of failures in the first year or two of operation due to inherent causes was greatly reduced, with the result that in 1928 the rates were less than 0.5 failure per 100 miles per year.

In general, the failures caused by inherent cable defects do not increase with increasing average stress within the range now in use, except for three-conductor belted cables operating at average stresses above 50 volts per mil, where there is a tremendous increase. Such cables are no longer being made in this country to operate at such high stresses (Table I.)

The highest stresses for the three-conductor cables with "solid" insulation are used with thicknesses of about 0.3 in., while the highest stress for the single-conductor cables with "solid" insulation is used in much thicker insulations.

Some of the reasons for the improvements in the art of manufacture, which was accelerated on account of the demand for higher voltage cables to operate at increased stresses, are as follows:

(a) The use of compounds which are more stable in service.
(b) The use of better insulating paper.
(c) Improvements in the evacuating and impregnating processes.
(d) Improvements in the supervision of factory processes.

With the use of high-voltage cables at "high" stresses, it seems from operating experience obtained in the last few years that there still remains a possibility of the insulation changing in physical and electrical characteristics in such a manner as to result in failures. The tests on the cable when new, which are required by cable specifications, do not give a definite indication of whether or not the insulation will remain stable in service; it appears, therefore, that one of the outstanding problems is the development of a practical and reliable test

Table I—Maximum Average Cable Insulation Stresses Now Being Allowed in U. S.

Type of Cable	Cable Stress, Volts per Mil. "Solid" Insulation	Oil-Filled Insulation
Three-conductor belted	43	...
Three-conductor shielded	50	68
One-conductor	55	106

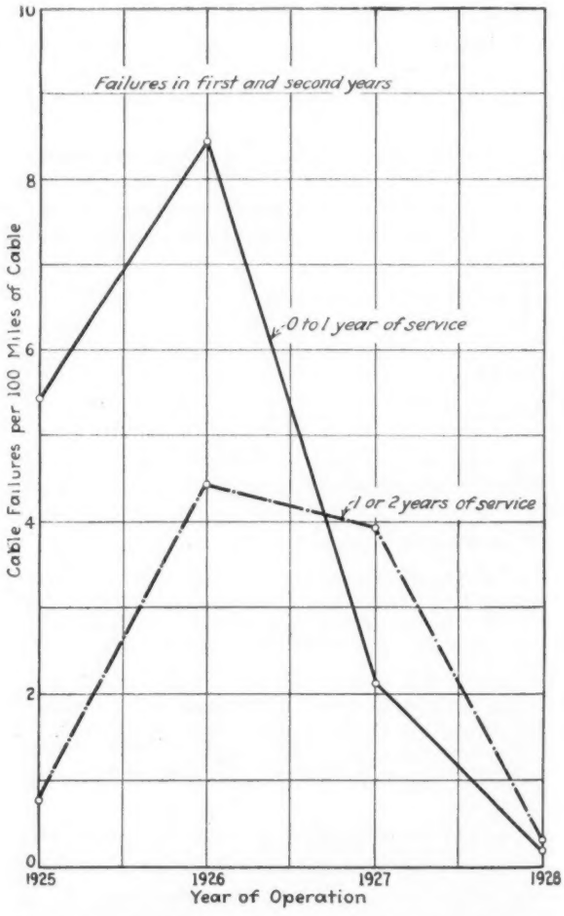


Fig. 4—Failures Due to Inherent Causes During First Two Years of Operation

Based on high-tension cable records of fourteen companies which have approximately 60 per cent of the cable in the United States. This graph again illustrates the high rate of failures due to inherent insulation weaknesses which occurred in cable furnished several years ago and reflects directly the improvement that has taken place in the last few years.

which will indicate whether or not part or all of the insulation in a new length of extra high-voltage cable will deteriorate in years of service.

There has been a rather slow decrease in the rate of failures due to causes not inherent in the cable. These causes have been and still are responsible for a major portion of the failures. Although improvement in the quality of insulation will help the cable to withstand

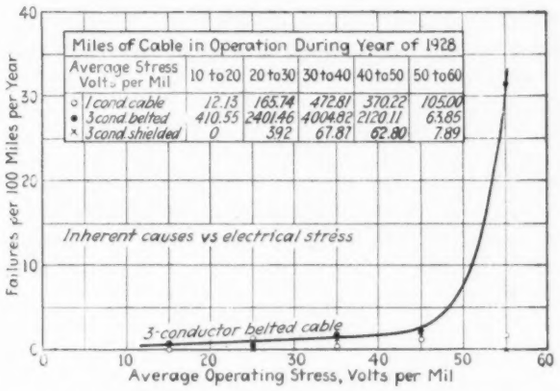


Fig. 5—Failures Due to Inherent Causes Versus Average Electrical Stress

(Oil-filled cables omitted)

some mechanical injuries without failure, it seems obvious that the main improvement to be effected is within the control of the operating companies.

The largest individual group in the non-inherent causes is corrosion of the sheath, which was found last year to be due entirely to direct-current electrolysis, chemical attack and galvanic action. No failures were caused by the presence of alternating-current potentials on the sheath. During the past six years 9 to 14 per cent of the cable failures have been caused by electrolysis.

The Commonwealth Edison Company in the past few years has given increasing attention to the problem of reducing failures due to external injuries, with the improvement in operation shown in Fig. 6. (Similar improvements in operation have been obtained during the past three years for 4-kv. distribution cables which have diameters of 0.6 to 2.3 in.) Perhaps the comparison shown is not entirely fair, since the cables have not all been in service the same length of time. However, field experience and laboratory tests using a dummy manhole, where cable is trained and moved back and forth once every two minutes, definitely indicate that the newer practices will cause a considerable decrease in the rate of failures due to mchanical injuries.

Some of the methods used by this company to obtain these improvements are as follows:

1. Better conduit construction.
2. Longer manholes.
3. Improved installation methods.
4. Proper cable training.
5. Improved duct mouth protection.
6. Better fireproofing.
7. Supervision by engineers in the field.
8. Lectures and demonstrations to workmen indicating the bad effects of poor workmanship.
9. Periodical inspection of manholes to locate and repair sheath cracks before failures occur.
10. Surveys for electrolysis and chemical conditions at least once a year for the entire system.
11. Survey of temperatures once or twice a year in the entire conduit system.

Field experience and laboratory tests indicate that the use of octagonal manholes affording a distance of 11½ ft. between entering and leaving duct mouths increase the life of the 3-in. cable sheath at least 50 per cent before cracking occurs, as compared to the life obtained with 9-ft. manholes. A similar improvement is obtained for 2½-in. cables when the separation between inlet and exit ducts is increased from 7 or 8 ft. to 9 or 10 ft. Careful supervision during conduit construction has reduced the number and severity of bends and occurrence of offsets along the length.

By the use of mandrels, steel porcupines and stiff brushes all loose material and projections adhering to the inside of ducts are removed, thus reducing damage to cable during installation. The use of proper lubricants has been of considerable aid in reducing pulling strains. During 1928 most of the failures in recent cables were caused by outside agencies, such as an excavating machine of an outside contractor. Now the company follows through permits issued by the city on outside construction work for the purpose of informing the contractors where conduits are located, thereby decreasing the possibility of conduit and cable damage.

The problem of duct mouth protection has been practically eliminated by the use of cushioned zinc shields which take the abrasion incidental to cable movement. Similar reductions in failures at duct mouths have been effected in both high-voltage and 4-kv. cables.

Most of the failures in manholes on cable recently installed have occurred in the bends. In 1928 the rate of failures in this region on the new installations was only 30 per cent of that on the older installations. By means of lectures and demonstrations the workmen have been

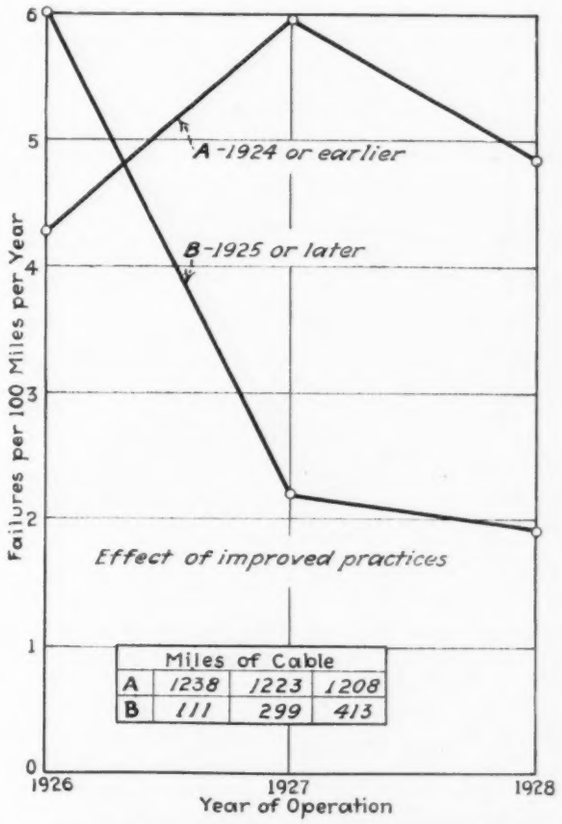


Fig. 6—Effects of Recent Improved Practices in Commonwealth Edison Company

Failures in high-tension cables not due to inherent causes classified by date of installations.

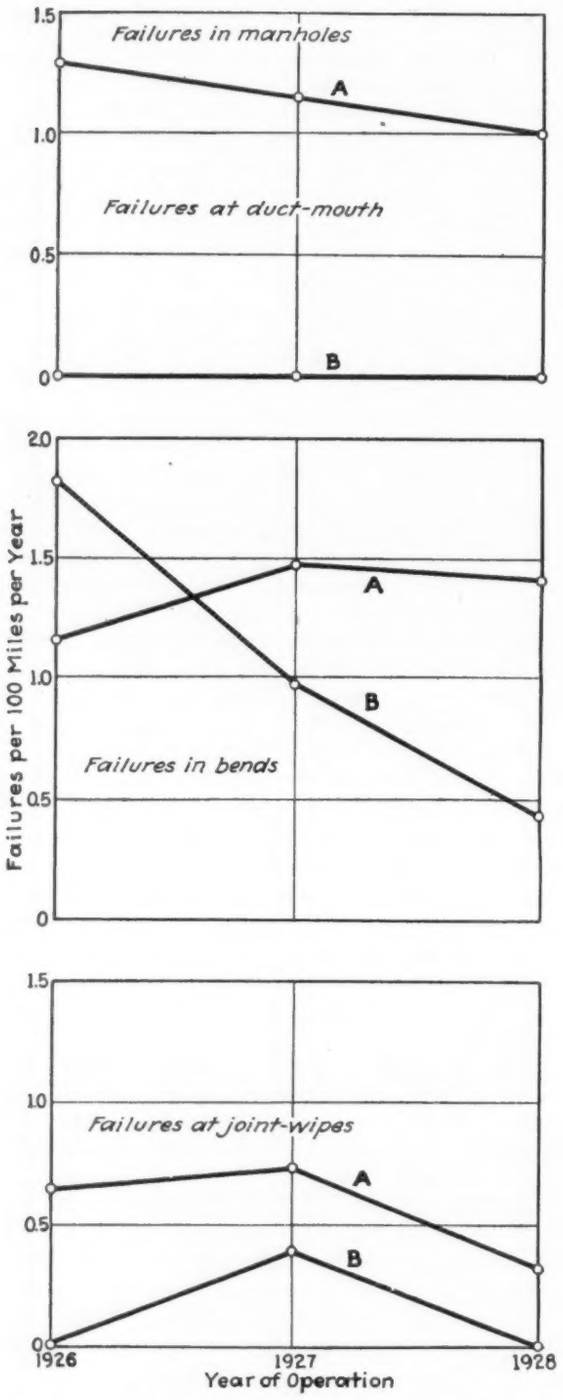


Fig. 7—Failures of High-Tension Cables in Manholes

Based on Commonwealth Edison records: (A) cable installed in 1924 and earlier; (B) cable installed in 1925 and later.

shown the bad effects of sharp bends on cable insulation, even where the cable was not left sharply bent.

This trouble at bends can be further reduced by the use of more flexible fireproofing than cement alone, or rope and cement, which many companies use. To minimize the possibility of corrosion due to alternating-current electrolysis on single-conductor cables, the Commonwealth Edison Company has adopted a form of fireproofing which differs from the usual. It consists of one layer of $\frac{1}{8}$-in. x 2-in. plain asbestos tape covered by rope and cement fireproofing. Laboratory tests with cable installed in a dummy manhole showed that the mechanical life of the cable sheath before a crack is developed is increased at least 50 per cent by the use of asbestos tape under the rope and cement.

Regarding failures at joint-wipes, it has been found that this trouble increases as the size of cable decreases. For instance, on rubber-insulated, lead-covered, pressure-wire cable having an over-all diameter of about 0.7 in., over 80 per cent of the sheath cracks in manholes have been found at the joint-wipes.

All manholes of the underground system are inspected at least every four months and locations with a large number of cables every two months. Unsatisfactory operating conditions are reported at once and rectified. The number of men used on this work is one for each 400 miles of cable. Comparison of these inspection reports with burn-out records showed that in 1927, for instance, there were eight times as many sheath cracks in transmission cable as there were failures in manholes. (The ratio was similar for 4-kv. and direct-current feeder cables.) Practically all of these cracks have been found on cables installed in accordance with the older practices. The inspectors also find occasional cases where joints have a partial failure and continue to operate.

Over 97 per cent of these sheath cracks are repaired by the following method, which has proved most satisfactory: About 2 in. of the lead containing the crack is removed, the insulation is freed of moisture by removing the outer few layers of tape where necessary and pouring hot oil on the remaining insulation, and the insulation is taped up to the level of the sheath. The lead is then made continuous by wiping on a tight lead sleeve. Other methods of repair, such as covering the break with a patch of solder or lead, have been found to be unsatisfactory, since frequently a new crack would occur at the edge of the patch.

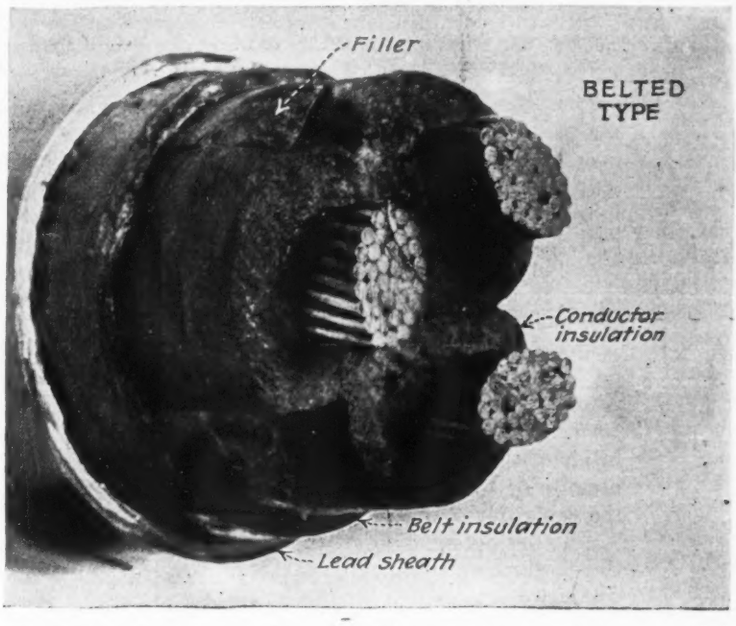
Periodic Analyses Eliminate Difficulties

In connection with electrolysis and chemical actions on the cable sheaths, surveys are made on the entire system at least once a year. Whenever the men find incipient sources of trouble, steps are taken to eliminate them. There is active co-operation also with men doing similar work for other utilities. In connection with the alternating-current potentials present between the sheaths of single-conductor cables on 66-kv. lines and ground, which are specially bonded to reduce or eliminate the flow of currents in the sheaths, yearly surveys are made to check the sheath voltages and to detect any corrosion. The sheath voltage readings, especially the initial ones, indicate whether or not the bonding connections and devices are correct. If positive direct-current potentials are found they are eliminated at once, since such potentials combined with the alternating-current potentials will cause rapid corrosion.

The men on the temperature work make surveys of the entire system once a year, excepting, of course, in those cases where there are only one to three cables present in the conduit. Around generating stations and substations, where the conduits are most heavily loaded, these surveys are made twice a year. Whenever a conduit route is proposed for a transmission line the temperatures are obtained along the entire route at points 20 ft. from each manhole in an empty duct. Then calculations are made of the copper temperature that would prevail at the time of the maximum load in the summer and in the winter. If these temperatures are nearly equal to, or in excess of, the maximum allowable

temperature of the cable, changes are made in the routing of the proposed installation or larger conductor sizes are used in the regions of high temperature.

By means of these detailed surveys it has been found feasible to give current ratings to the cables which will result at full load in temperatures closely approaching the maximum allowable temperature. In other words, if the surveys were not made, a much larger margin



Shielded Type Is Now Preferred for Three-Conductor, 33-Kv. Cables

would have to be allowed in the copper temperature in determining the allowable current rating in order that the conductor temperatures would not exceed the maximum permissible temperature. Obviously, this practice results in more efficient loading of the cable and reduced investment costs.

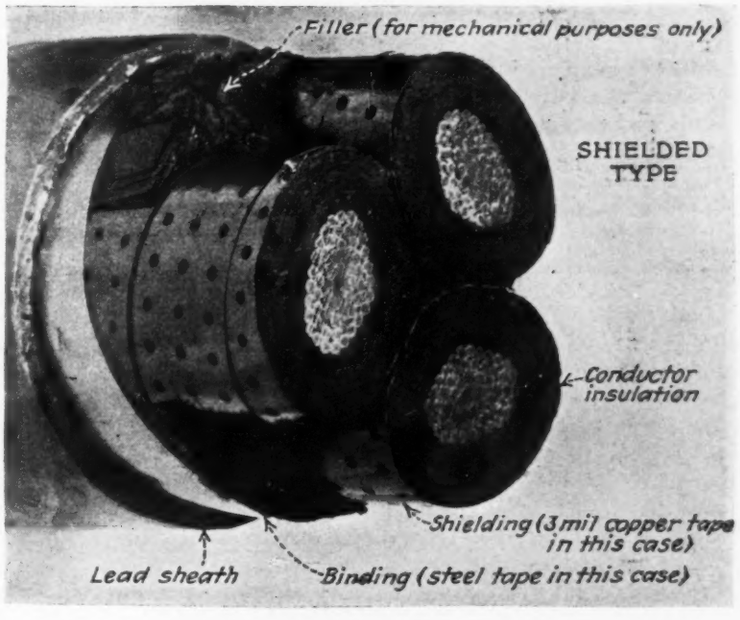
Each year 10 to 15 per cent of the cable failures in the United States have been listed under unknown causes. In some of these cases a thorough examination has been made of the fault, of the operating records and of other information available, yet no definite indication of the origin of the trouble has been suggested. Frequently, the cable has been badly burned at the point of failure and mutilated upon removal until the evidence has been destroyed. In all such cases the causes of failure are and must be properly classified as unknown.

It appears, however, that frequently the failure is regarded in this category because the operating company has not investigated the case sufficiently to determine the cause. In many companies the percentage of failures ascribed to unknown causes could be reduced considerably by more thorough training of the men assigned to this work. In most of the companies having large amounts of underground cable the failures in high-tension cables are being examined by an engineer from the Electrical Testing Laboratories of New York City. In this way the experiences of these companies are being pooled and the men of the various companies are being trained along similar lines. More reliable classifications of failures are anticipated.

The amount of high-tension varnished cambric and rubber-insulated cable in use in 1928 (as reported to the N.E.L.A. subcommittee on cable operation) was 218 miles, or about 1.9 per cent of the total high-tension cable. The operating stresses on these cables were considerably below the stresses for paper-insulated cables. Twenty-seven per cent of the paper-insulated cables were operating at stresses above 40 volts per mil, as compared to only 4 per cent of the other class, of which 60 per cent had average stresses of about 30 volts per mil. The rate of cable failures due to inherent causes was 2.3 per 100 miles per year for the varnished cambric and rubber-insulated cables, as compared to 1.5 for paper-insulated cables.

In underground cables in this country there has recently been a marked increase in the use of three-conductor shielded cables for service at 22 to 33 kv., inclusive, and in the use of single-conductor cables particularly for voltages above 33 kv. The amount of the three-conductor shielded type cable increased from 1 per cent of the total cable in 1927 to 2 per cent in 1928, while the corresponding change for single-conductor cable was from 8 to 13 per cent.

The advantages of these two types of cable are indicated by the fact that the rate


Filler (for mechanical purposes only)
SHIELDED TYPE
Conductor insulation
Shielding (3 mil copper tape in this case)
Lead sheath
Binding (steel tape in this case)

of failures in paper-insulated cables due to inherent causes was 0.76, 0.78 and 1.67 per hundred miles per year, respectively, for single-conductor, three-conductor shielded and three-conductor belted cables.

On the belted type of three-conductor cable the insulation is applied around each conductor and then a belt of insulation around all three conductors, while on the shielded type of cable a metallic covering, such as a thin copper tape, is wrapped around the outside of the insulation on each conductor and there is no belt of

insulation. In the shielded cable the voltage stresses are only between conductor and the shielding on the outside of the insulation of the given conductor, and for cables with round conductors these stresses are only radial, while for cables with sector conductors there may be a slight stress along the surface of the paper tapes (tangential stress). On the belted type of cable the tangential stresses are considerable, because, for instance, there will be a potential at a point midway between the center of the two conductors, while the third conductor will be at zero potential, thereby creating a stress along the surface of the insulation. These surface or tangential stresses resulted in a large portion of the failures experienced in three-conductor belted cables operating at 24 to 33 kv.

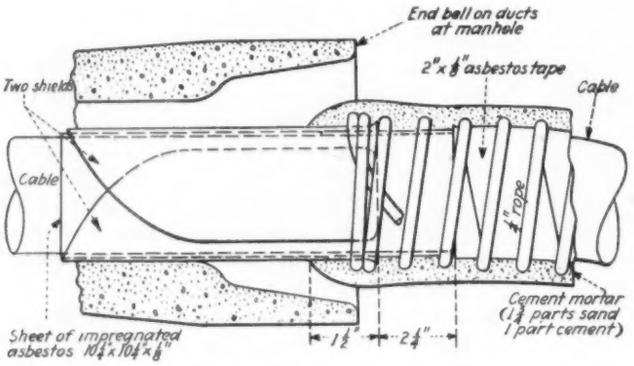


Fig. 8—Duct-Mouth Protection

A sheet of asbestos, which is impregnated with an asphaltic compound, is wrapped around the cable with a slight overlap and then a zinc sheath is placed around the sheet to rest on the bottom of the duct. As an additional precaution for extra high-tension cables a shield is also put over the top of the cable to prevent possible damage to the cable through rubbing against the top of the duct entrance. With the shields firmly held by the overlap of the fireproofing materials, the abrasion due to cable movement is on the shields instead of on the cable lead.

Other advantages of the three-conductor shielded cable over the belted type are as follows:

1. The dielectric strength for a given insulation thickness is at least 25 per cent higher.
2. The shielding decreases the thermal resistance between conductor and sheath and allows an appreciable increase in carrying capacity.

In 1928 the total rate of failures due to all causes was 30 per cent less per hundred miles of cable per year for single-conductor than for three-conductor belted cable. Since there is three times as much single-conductor cable on a line as there would be with three-conductor, the rate of failures per hundred miles of line has been approximately 100 per cent higher than that for three-conductor belted cable. The high rate for the single-conductor, however, has been caused principally by the performance of cables operating at moderate voltages. For instance, on the 112 miles of 66-kv. cable installed in Chicago in 1927 and 1928 there has been only one failure, that being due to an excavating machine digging into the conduit.

An outstanding point in favor of single-conductor cables is that the failures are confined to one phase when the cables are installed in separate ducts. Such faults are considerably less severe on the system than faults that frequently develop between phases on three-conductor cables. One company has installed a portion of its single-conductor cable, most of this portion operating at 11 and 13 kv., with three cables in one duct; in such instances the possibility of failures between phases, as indicated by theoretical considerations and practical installational experience, is somewhat less than may be anticipated with three-conductor belted cables.

Other advantages of single-conductor cable besides that of phase isolation are indicated by the following:

1. Decreased investment costs for transmission of large blocks of power.
2. Approximately 40 per cent higher dielectric strength per unit thickness of insulation as compared to insulation in three-conductor belted cables.
3. Allowance of direct connection to extra high-voltage overhead lines without transformers, which are necessary in many cases when three-conductor cables having limited allowable voltages are used.

One disadvantage is that when single-conductor lines are placed in parallel with existing three-conductor lines operating at the same voltage, the latter lines take more than their share of the load on account of their lower impedance. The Commonwealth Edison Company, however, has had satisfactory load division between 12-kv. buses of generating stations, when they were connected through separate transformers, supplying 22-kv. and 66-kv. lines.

On single-conductor, extra high-voltage cables shielding tape has been used to some extent in order to remove voltage stresses from the void space that might be formed between the outside of the insulation and the inside of the lead sheath, which may be expanded slightly because of wrinkling or of expansion and contraction in the cable during operation.

Another outstanding recent tendency in this country is the adoption of oil-filled construction for 132-kv., single-conductor cables. The insulation thickness on these cables is $\frac{23}{32}$ in., which was $\frac{1}{32}$ in. less than the minimum used for 66-kv. cables in this country. The first installation of such cables involved considerable research work in the field, but was found to be not nearly so formidable as might be expected at first consideration of the elements involved.

The principal advantage of the oil-filled type of construction over the ordinary type is that the amount of moisture and gases entrapped in the insulation is reduced to a very small percentage of the total volume, and the insulation is generally under positive pressure, with the result that at practically no time can a void be formed in the insulation on account of contraction when load is decreased on a line. There have been no failures in test or service on the 52 miles of the 132-kv. cable which has been in operation for more than 1½ years.

Since the original installation of 132-kv. cable reports have been received from two manufacturers indicating that considerable progress has been made in connection with simplifying the problems of installation.

In the fall of 1928 the Commonwealth Edison Company, in order to obtain experience and aid development, put into service 2,000 ft. of three-conductor, oil-filled, 33-kv. cable. The problems of installation were fairly simple and there has been no trouble in service.

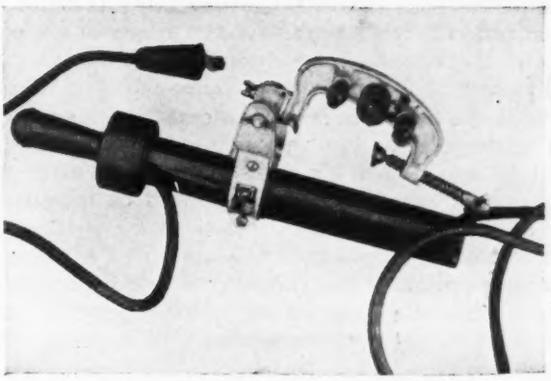
Reports on work being done here and abroad show that the limits for insulation of ordinary construction have not been reached by far, hence the proper dividing line between the oil-filled and ordinary types of construction will probably be a changing figure. In any event, it seems that joints will not limit the allowable voltages for underground cables.

EDITOR'S NOTE—This is the first of two articles by Mr. Halperin on cable operation. The second, covering tests, joints, pot-heads, oil reservoirs, sheath bonding and general conclusions, will appear in an early issue.

Fault Location Simplified by Feeder Tester

IN LOCATING and clearing trouble on 2,300/4,000-volt distribution feeders of the Public Service Company of Northern Illinois a special feeder tester is employed that eliminates hazards, simplifies operation and saves time.

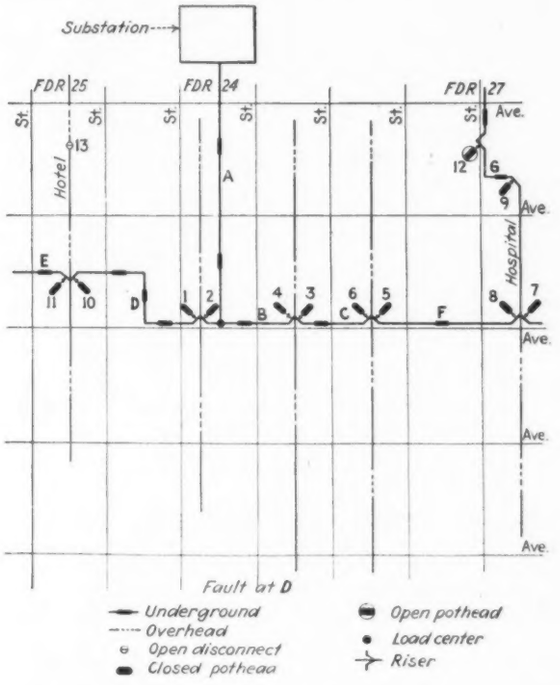
When a feeder trips, it is sectionalized on the pole line at its most important point and the station oil circuit breaker closed. If the feeder holds, indicating that the portion of line up to that point is clear, the line is checked with the tester to successive sectionalizing points beyond the first without again interrupting service to the customers on the portion previously energized. The tester consists of an ejector type cutout, equipped with a mounting, whereby it can be conveniently clamped to a crossarm. In use, the tester is connected so as to cut out the potheads or disconnects at the point to which the feeder is energized and the circuit closed through the tester. If the fuse blows it indicates that the trouble is in this section and service can be immediately restored to other parts of the feeder through emergency centers. With the fuse holding, showing the line to be clear, service is restored to the section under test, the cutout removed and the test repeated at some point farther along in the system. In locating trouble temporary connections can be made on potheads where underground wires rise to the aërial, in manholes on distribution boxes or on overhead emergency centers equipped with disconnects.



Feeder Tester Used to Locate Trouble on Distribution Circuits

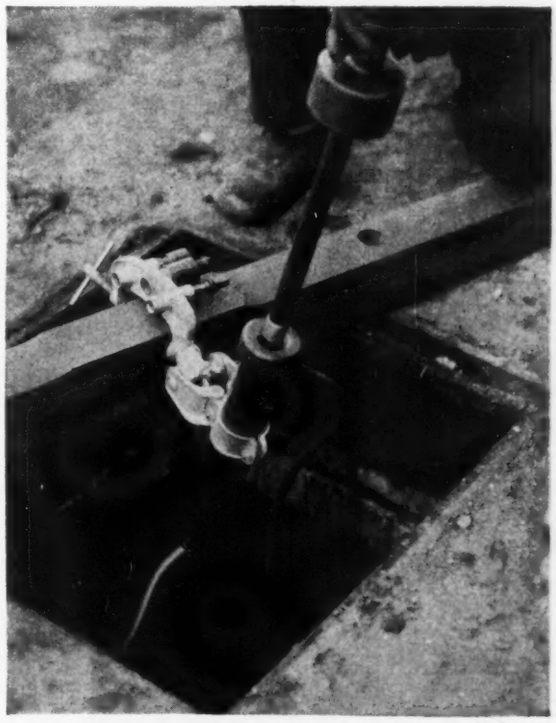
The cutout has been fitted with 6-ft. No. 6 extra-flexible 6,000-volt rubber-covered leads and 50-amp. test clips with rubber insulators. By means of two thumb-screw adjustments any horizontal or vertical position can be obtained. With this arrangement the tester is installed so that proper clearance is secured from all phase wires and the open end of the cutout is directed away from the man closing it.

For cable work the tester is provided with holders for different types of connector plugs. The carrier sockets for the connector plugs are located on the web part of the bracket as shown. With this type of plug connections can be made to potheads heaving No. 6, No. 1/0 and 350,000-circ.mil cable, respectively. In making a test the connector is removed from the socket and



Typical Manner of Fault Location

To illustrate the procedure followed in restoring service to an interrupted feeder we will assume that feeder 24 shown on the sketch tripped out at the substation. A trouble man is dispatched to open down feed pothead 24-1. The location picked is the most important point on the feeder, as the first station test will determine whether the cable section feeding the hospital is clear or in trouble. After pothead 24-1 has been opened the troubleman calls back and the supervisor has the station operator energize the feeder. The oil circuit breaker is closed and the feeder holds, restoring service to the hospital. The supervisor then orders up feed pothead 24-10 open and the feeder tester applied at pothead 24-1. The fuse blows, indicating that the fault is in underground section D. Potheads 24-1 and 24-10 are left open and emergency disconnect 13 closed. The section of feeder 24 beyond the fault is thereby cut to feeder 25. The engineering department is then called and the exact location of the trouble found with a cable fault locater.



Using the Tester in a Cable Manhole

placed in the open pothead, one clip being attached to this plug and the other to the live cap or top of the pothead and the circuit closed through a 20- or 50-amp. fuse by plugging in the cutout handle.

In addition, the tester is used to carry temporary sectional feeder loads. For that reason three testers are carried by troublemen for test purposes and after the fault has been located the cutouts are left on the phases which are not in trouble until repairs on the phases that are in trouble have been made.

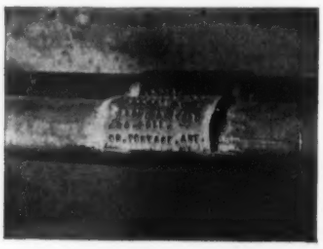
In the operation of the system it is first necessary to establish sectionalizing points and transfer points as potheads and disconnecting switches. The sectionalizing points are so established that each underground or overhead section of the feeder which lies between points where load is taken off may be isolated. To establish sectionalizing points the feeder cable is brought up poles and terminated in potheads. Points where various sections of the feeder may be transferred to other feeders are also established.

Sectionalizing points, such as emergency centers and up-and-down cable feeds, have been numbered and such numbers are preceded with the feeder number, as 24-2. Even numbers have been assigned to up feeds and odd numbers to down feeds and overhead emergency centers Aluminum numbers to identify location are placed on the crossarm so that they are directly in front of the man at work.

When a new feeder is being installed an operating routine is drawn up. The routine is worked out in detail for each section of the feeder. The design of the feeder and the layout of the routine should be such that in case of trouble service is restored quickly to the various sections. Those sections having important consumers are on a preferred list. An operating binder is maintained which contains all the feeder maps of a given substation. Opposite the feeder map is placed the operating routine.

Permanent Cable Markers

TO IDENTIFY underground cables in Winnipeg it was once customary to attach metal tags to them with a wire. One day the tags were removed from several cables and not replaced. Later a workman cut into one of these cables while it was energized because of confusion as to identity. Now the cable data are stamped on a piece of sheet lead or old cable sheath about 2 in. wide and 3 in. long, according to T. A. Robinson of the Winnipeg Hydro-



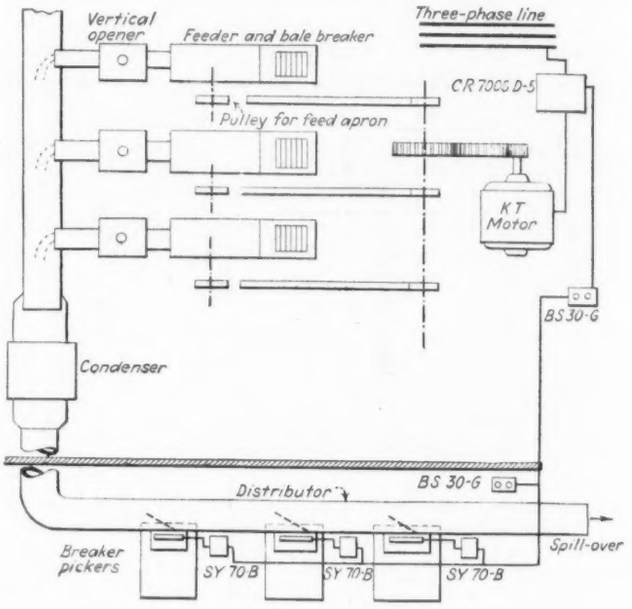
Electric Commission. This label is molded to fit the cable and wiped onto it. For cables of 12,000 volts and over having a protective fireproof covering the identification plates are tied on with two copper wires soldered to the ends of the plates. Thus, cable markers cannot be easily removed and it is unlikely that they will be by accident.

Cotton Distributor Control

By H. W. Wikle
General Electric Company, Atlanta, Ga.

IN THE past it has been necessary for cotton mill operatives to be on the lookout so that only enough cotton is fed to the distributor to take care of the requirements of the various breaker pickers, thus preventing too much cotton from going over the spill-over.

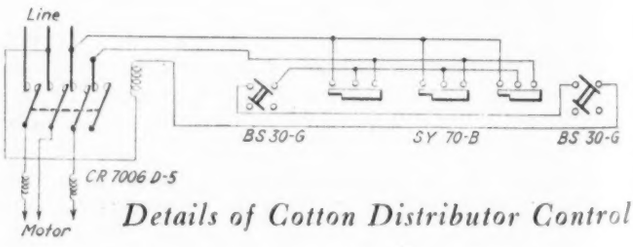
The cotton machinery manufacturers who make the



Operations Between Bale Breakers and Pickers Co-ordinated by Electric Control

breaker pickers to be used in connection with the distributors provide an automatic gate arrangement for opening and closing the inlet to the breaker pickers from the distributor. By adding master switches to these automatic gates a scheme was worked out so that it would be necessary for all three of the gates to be opened before the motor, feeding cotton from the feeders, would deliver any cotton to the distributor.

Use was made of two push-button stations as safety devices so that the operation could be stopped manually at the operator's will in either the opener room or picker room, and also so that these buttons could be opened to prevent the motors from starting, if desired. All three of the master switches must be open before the motor will be stopped automatically. However, if any one of



Details of Cotton Distributor Control

the three master switches closes, the motor will be started, provided the push buttons are both in the closed position. If all three of the master switches are open when the motor is stationary it cannot be started until one of them is closed.

A Perfectly Lighted Town

All Under One Roof

By JOHN A. DEWHURST
McGraw-Hill Publishing Company, Inc.

Looking down "Mazda Avenue," on which is virtually every type of business establishment properly lighted

IF THE reader were a passenger on the *Los Angeles* sailing over New York's Grand Central Palace and could peer through the roof and upper floors he would see below a modern village neatly tucked within the walls of that building. It is a model village in that it comprises the essential elements that typify city life today; of course, with emphasis placed on artificial illumination, because this is the Institute of Applied Lighting built by the Westinghouse Lamp Company and dedicated to the better illumination of homes and factories, streets and offices.

While the Institute is virtually a life-sized spectacle, in that many usual and unusual lighting plans will be in operation, it is the underlying thought that this collection of civic entities will be a practical laboratory where illuminating engineers and lighting specialists from all over the country may come for the purpose of studying applied lighting.

Commercialism is placed in the background. Products of allied companies as well as competing products are shown. The staff of guides and illuminating engineers that the company will maintain on the premises, under the supervision of Director Ralph Neumuller, are there for the purpose of helping to solve lighting problems that are brought to them.

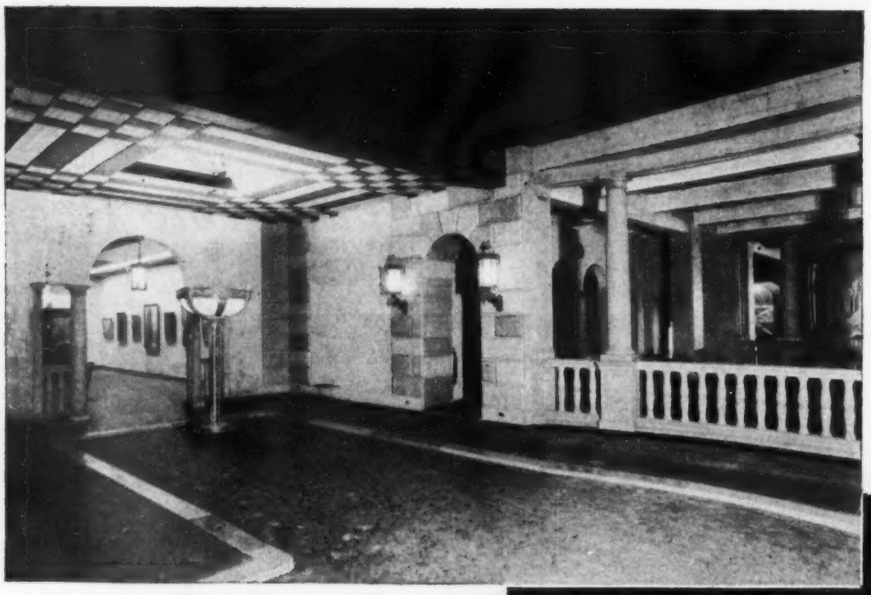
History is left respectfully alone. This is not a museum. America stands in the present with eyes fixed on the future, and this Institute likewise has been designed to interpret light and lighting for the present and future needs of our commonwealth. Light is a faithful servant of the people; to serve well, it must be applied well. And that is the prevailing motif of the Institute.

From the elevator lobby one enters the reception room, illuminated by sixteen luminous pilasters, illustrating a treatment of a modernistic type. By the operation of switches on the wall three distinct color motifs may be observed plus combinations of these three. From here one passes into the public hall, which is a beautiful stone-walled room topped with a barreled beam ceiling construction. Automatic color changes from lights hidden in coves give a lighting treatment suitable for hotel and theater lobbies.

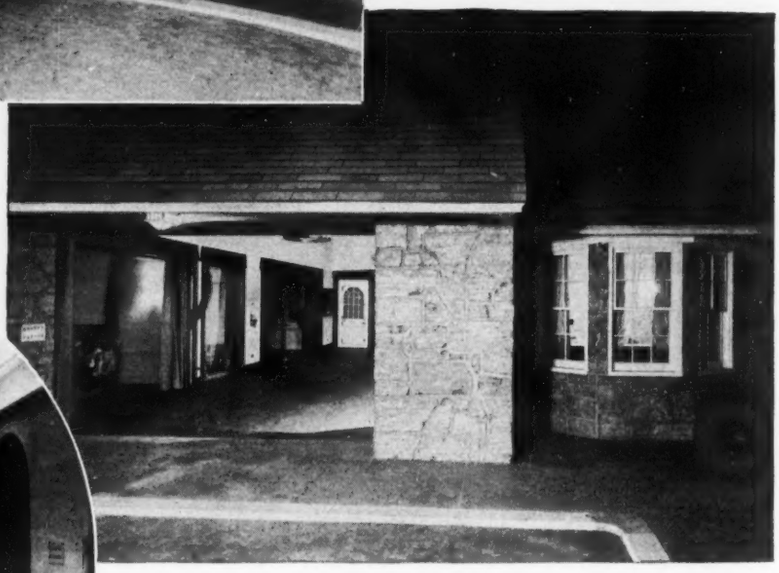
The exit from this room opens directly into the court at the head of "Mazda Avenue." At one end of this thoroughfare is the beautiful loggia typifying the exclusive country club veranda, which with its electric fountain, colored umbrellas, tea tables, etc., all flanked on the side by the stone façades, presents an inspirational treatment combining color, light and architecture suitable for this type of construction.

Standing on the raised tiled floor of the loggia the visitor looks down the length of a full city block and through an enormous mirror apparently into a second block. Illumination has not been spared, yet it is all in keeping with good practice. Primarily, the street is lighted from modern standards. The store windows and

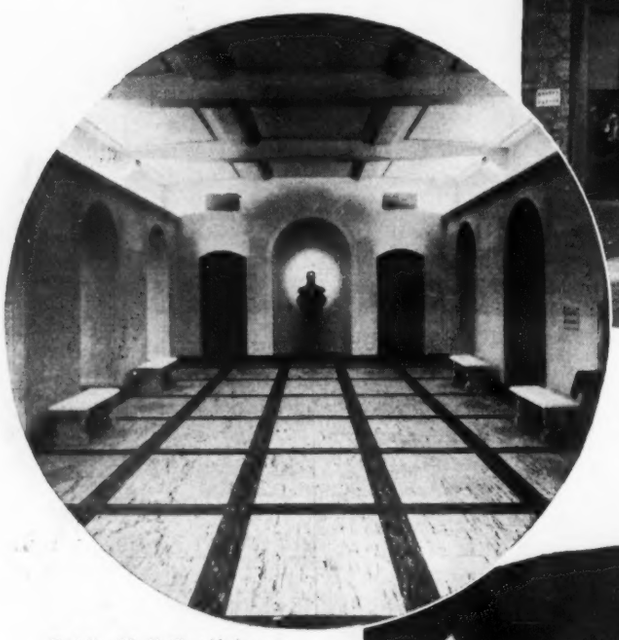
Significant Corners of the Institute of Applied Lighting



A Pleasing Combination of Architecture and Light at Head of "Mazda Avenue." Through the Arch Is the Art Gallery



Interior of This Early American Home Shows Latest Ideas in Illumination



Public Hall Typifying a Modern Hotel or Theater Lobby Cove Lighted with Changing Color

Central-Station Store Shows Model Arrangements

theater lobbies add to this, presenting a picture representing a co-ordinated example of applied lighting practice.

On the right is a typical central-station store set up complete and ready to operate. Across the street is a smaller electrical contractor-dealer store, simple but well designed, representing a type that might readily be duplicated in hundreds of American cities. The store equipment consists of standard movable units so that in a few hours' time a different arrangement may be made and the results observed.

Adjoining the central-station store is the entrance to a theater, in which subtle lighting effects so desired in the modern theater may be created, not only on the stage but in the body of the theater itself. The ten-scene preset motor-operated theater switchboard is unsurpassed by any theater in completeness and flexibility. With the number of plays created in New York this theater alone, with its complete equipment, even to backstage apparatus and dressing rooms, promises to be a valuable asset to the profession of theatrical production.

Again returning to "Mazda Avenue," one may see examples of shallow and deep department store windows completely dressed by Macy's. Adjoining these windows is a stone bank front and behind this a large room devoted to the display of electric advertising signs and floodlighting for both interior and outdoor use. Among the interesting features of this room are the facilities available to architects. Here the models of public buildings may be placed and with reduced-size floodlights the exterior illumination of these models can be studied and planned. The savings made possible by avoiding useless experimentation under actual conditions should encourage greater use of light for this purpose. In this room the visitor is relieved for a moment from the close study of light application to view Broadway's great "White-Way" as it appears from a balcony of the Times Building. Every illuminated sign has been faithfully reproduced in miniature and placed in running order.

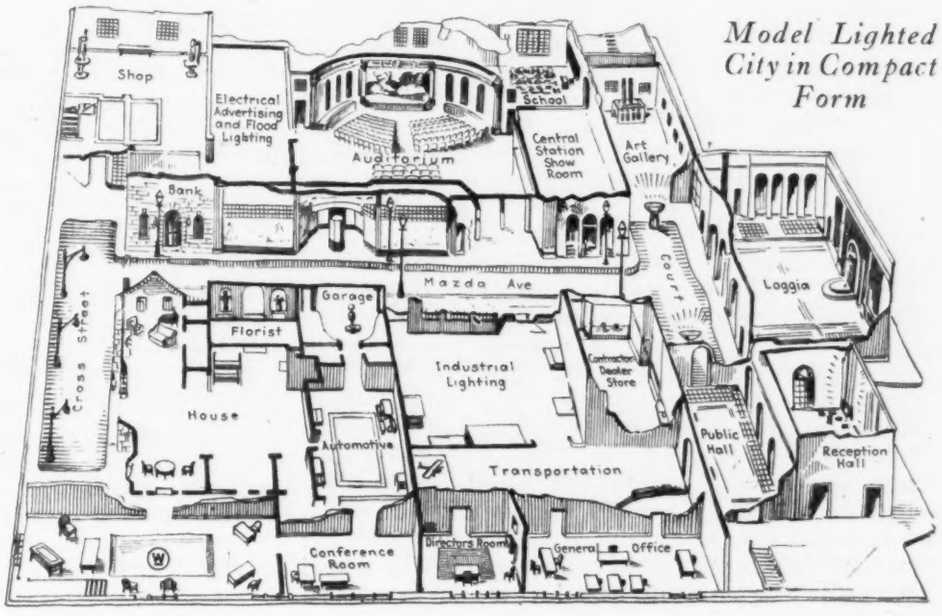
Also facing the avenue is an early American home, the central hall of which is expanded to provide a small lecture room. The normal rooms of the house open from this. By a snap of the switch many modern types of home lighting can be immediately demonstrated. Fixtures automatically disappear and others take their place, illustrating a wide range of effects.

There are a few lighting "stunts" to interest the visitor, but primarily the best practice of the day is demonstrated. Not an idea is developed that cannot have its application in hundreds, even thousands of similar conditions throughout the country. It is indeed a fountain head of ideas.

In addition to these units there is an industrial building with typical machines in use, making it possible to demonstrate and measure general lighting as well as concentrated lighting required for many machine and bench operations. A garage and service station facing the avenue will be of interest to the thousands engaged in the fleet operation of automobiles or in public service stations.

Opening from one side of a well-lighted corridor are general and private office layouts, developed in such a beautiful and effective manner that they must be seen to be appreciated. Nor has the school situation been overlooked, because tucked away in one corner of this compact city is a small schoolroom with artificial daylight plus interior lighting that has been designed to relieve the eye strain so frequently caused by poor lighting in schools.

Every form of transportation is represented in a room set aside for this purpose. Cars, buses and a miniature railway in actual operation are there to demonstrate the use of light. The model airport will be a source of great interest and value because a group of civic officials can see from the actual working model the different combination of airport lighting possible for different expenditures of money. This feature alone, with aviation still in its infancy, will prove of great value not only to aviation but to the light and power industry, so often called upon for recommendations as to best lighting practices in new developments.



Model Lighted City in Compact Form

Little space is left to tell of the art gallery, in which the model of Hell Gate station has been placed, the concentrated light panel for the modern operating room, the florist shop and the many "robot" features—all serving to show the present and future possibilities that lie before us.

Two carloads of wire and cable are draped between the walls or concealed in conduits in the floors. Eight control rooms with 300 contactors tell the story of the flexibility of control. The wall switches operate only the control circuits of the myriad of contactors used in the assembly. The ventilation equipment is centered in five fan rooms housing seven intake and two exhaust fan units, having a capacity of 40,000 cu.ft. of free or recirculated air per minute, sufficient to change the air completely every three minutes.

The institute will be open to visitors from 10 a.m. to 5 p.m. daily except Sundays. Special arrangements may be made for evening meetings and parties.

N.E.L.A. Sponsors Food Preservation Program

Will join forces with organizations outside electrical industry, like medical, food and ice, to obtain public acceptance of proper temperature for food preservation

TEACHING the millions that 50 deg. is the danger line on the thermometer for the proper preservation of perishable foods is the object of a nation-wide program now being rapidly organized by the National Electric Light Association in co-operation with a score or more of other national trade organizations. The movement will be known as the national food preservation program. It will be concentrated in the month of September, although preliminary work will be going on actively throughout the summer.

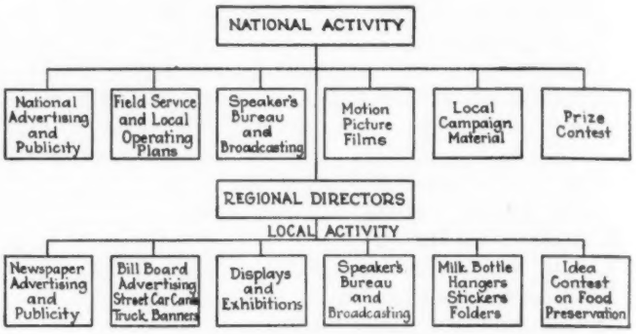
The fundamental purpose of it will be to impress on the American public: (1) The relationship between food spoilage and health; (2) to establish in the public's mind a perishable food temperature of 50 deg. or less; (3) the causes of food decay and bacteria growth; (4) the vital need for all-year refrigeration.

Every avenue of advertising and promotion, national and local, will be employed to focus public attention on the benefits to health and economy of proper refrigeration all the year around. A program will point out that the Weather Bureau records show that 50 deg. is maintained indoors only nineteen days a year as a national average. National advertising and promotion will be handled directly by the National Council and its committees and local activities by the local councils which are being set up by regional organizations, of which there are thirteen, each with a regional director. Six traveling field specialists have been engaged to spend their entire time during the next three months in assisting regional directors and working out their organizations and plans. The local councils will in most cases center around the electrical leagues and will include all the electrical interests, gas companies, ice companies, milk companies, merchandisers of refrigeration and of perishable foods, the medical societies, etc.

Among the national organizations which have been invited to participate are the American Medical Association, the General Federation of Women's Clubs, the Society for Electrical Development, the American Gas Association, the National Association of Ice Industries, the National Refrigerator Manufacturers' Association, the National Dairy Council, the International Association of Ice Cream Manufacturers, the United States Fisheries Association, the Institute of American Meat Packers, the California Fruit Growers' Exchange, the Florida Citrus Exchange and the American Bottlers of Carbonated Beverages.

A national "idea contest" will be conducted on the subject "Why 50 Degrees Is the Danger Point," with a $10,000 model electrical home as the principal prize and many smaller prizes.

Only once in a decade does the commercial section have an opportunity to initiate a program as large in scope and as helpful. This is the first time in many years in which it can look for assistance outside of the industry in carrying on development work.



Food Preservation Program Will Be Well Organized

Matthew S. Sloan is president of the National Council, J. E. Davidson is vice-president, and P. B. Zimmerman* is secretary. Marshall E. Sampsell is chairman of the executive committee, composed of C. E. Greenwood, P. S. Young, J. E. Davidson, E. G. Biechler, George W. Mason, Paul S. Clapp, C. L. Dunn, P. B. Zimmerman and E. S. Vail. George F. Oxley is chairman of the publicity committee.

**General Electric Company, Cleveland.*

This activity gives the electrical industry the opportunity of association with the perishable food industry and a new task of public endeavor that can be greatly beneficial to all electric customers and the purchasers of perishable foods.

There is a great need to establish a food temperature in this country and in gaining an acceptance of this temperature standard an opportunity is afforded to teach the American public the relation of food properly preserved and better health.

Annealing Rivets in Lead-Melting Pot

By E. H. Rusch
General Electric Company, New York City

AN INTERESTING installation has recently been made by Brewster & Company, Inc., New York, of a standard lead-melting pot for the annealing of duralumin rivets. This pot has two electric sheath wire immersion heating units, with a combined rating of 5 kw., supplied from single-phase, 230-volt, 60-cycle alternating current. It is operated at 930 deg. F. and is automatically controlled by a controlling pyrometer with thermocouple and an automatic control panel. The annealing bath consists of equal parts (by volume) of sodium nitrate and potassium nitrate in molten state.

The current is turned on at 7 a.m., the operating temperature of 930 deg. is reached at 10 a.m. and it is shut off at 5 p.m. With the cover shut all night the pot has a temperature of about 200 deg. F. at 7 a.m. After reaching the operating temperature, the automatic control keeps it "on" for eight minutes and "off" for three minutes, with a normal amount of work. Power consumption is about 40 kw.-hr. daily for a ten-hour day.

Off-Peak Electric Heating
of Buildings

Full data on houses in Fort Wayne show domestic load possibilities of electric house heating. Description of off-peak storage heating system. Advantages to utility of heating service

DURING the past winter heating season a very extensive set of tests of electric house heating have been conducted in a number of residences in the Middle West, many of which are located in Fort Wayne, Ind. The ELECTRICAL WORLD has had the opportunity to examine some of the results of these tests in so far as they have been briefly summarized. The results are of great value and, on analysis, permit the drawing of conclusions that will, it is believed, be of considerable significance to the householder and to the public utilities.

To the householder there is presented a satisfactory form of automatic heating for a residence with many very desirable characteristics and at costs both for installation and operation that are within reach of those householders requiring automatic heating of best quality.

To the utility it presents, first, a problem as to the establishment of a rate, but in connection with this problem it opens a field for the use of electrical energy on an off-peak basis that may be said to dwarf the present accepted averages for domestic consumption. A domestic consumer averaging 500 to 1,000 kw.-hr. per year through the use of lights and all of the other on-peak appliances may be changed through his use of an electric house heating system into a consumer using from 30,000 to 65,000 kw.-hr. per year.

To the householder the advantages which can be presented by the use of the systems installed in Fort Wayne are as follows:

Primarily, absolute cleanliness. No smoke, smudge, ashes, dust, dirt.

Complete elimination of combustion, fire or flame of all description from the house.

Complete elimination of gases, fumes or odors incidental to combustion.

Constant temperature automatically regulated to the degree desired.

Complete automatic control.

Heat available instantly whenever required.

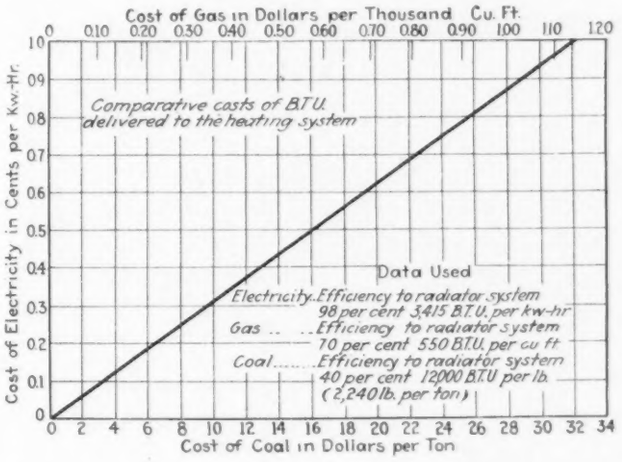
No possibility of fuel shortage.

No noise.

DESCRIPTION OF SYSTEMS

The heating systems provided in Fort Wayne by the Hall Electric Heating Company of Philadelphia are based on the well-established principle of thermal storage by means of a hot fluid and utilizing this heat when desired. Briefly, the system consists of a tank or tanks containing the required amount of fluid, which is heated to 300 deg. F. by electric heaters during periods when off-peak and cheap power is available and is delivered as required either directly to the ordinary type of radiator throughout the building or is used to heat air which is circulated through the building. In the case of hot water circulation a pump is used to insure positive circulation to the radiators. When the radiation system is for hot air, fans are employed to draw air from the building through properly placed ducts, pass this air over the heated surfaces and then deliver it to the rooms through the conventional type of hot air flues and registers.

The control of the current for heating the fluid in the main tank and for the operation of the pumps and fans is all taken care of by a relatively simple control panel and house thermostat, the apparatus used being special equipment which has been under development and test for many years.


Cost of Gas in Dollars per Thousand Cu. Ft.
0 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.80 0.90 1.00 1.10 1.20
Cost of Electricity in Cents per Kw.-Hr.
0 0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1.0
Comparative costs of B.T.U. delivered to the heating system
Data Used
Electricity..Efficiency to radiator system 98 per cent 3,415 B.T.U. per kw-hr
Gas .. ..Efficiency to radiator system 70 per cent 550 B.T.U. per cu ft.
Coal.....Efficiency to radiator system 40 per cent 12,000 B.T.U. per lb. (2,240 lb. per ton)
0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34
Cost of Coal in Dollars per Ton

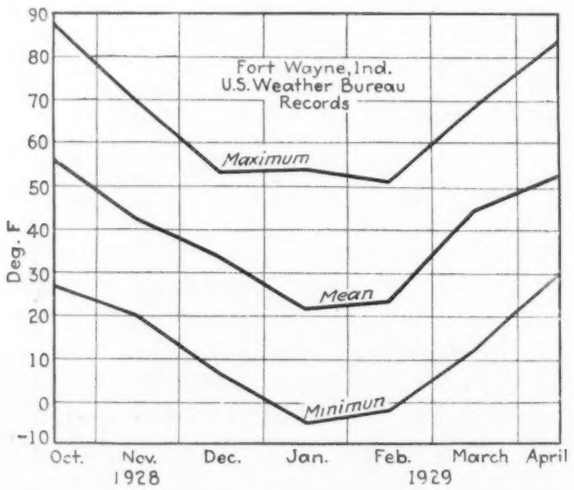
Comparative Costs of Heat at Radiators with Fuel and Electricity at Different Prices

The eighteen heating systems shown in the accompanying tabulation represent twelve hot air and six hot water systems. Of the hot water systems, three were formerly operated as vapor systems that were changed at no additional expense.

The question of operating costs is, of course, in the mind of the careful householder. These costs depend on the rate available and an estimate can be obtained from the accompanying tabulation. The savings incidental to this form of heating should be carefully evaluated in connection with the consideration of operating costs. Some of these are: Elimination of janitor charges for coal and ash handling; elimination of costs of cleaning draperies, curtains, and even the cleaning of the rooms themselves; elimination of stacks or flues; reduction of air changes per hour in the house due to the removal of combustion and realization of

the long-anticipated electrified house under push-button or automatic control.

In analyzing operating costs with this form of electric heating the general subject of thermal insulation for houses must be considered. The best and most complete application of insulation will reduce heat losses approximately 50 per cent. While it is not intended to discuss thermal insulation in detail in this presentation, it is referred to in order to point out the bearing which it has on operating costs. Thermal insulation acts to reduce the heat requirements for a building and this saving can be used to the maximum extent only in buildings where combustion is eliminated, as in those heated by electricity.



Official Outside Temperature Records for Season of House Heating Tests

The first cost of the electric heating system is about as important as the running cost. Considering an average size residence of 22,000 to 28,000 cu.ft., the cost of the Hall heating system is said to be comparable with the cost of the boiler, oil burner and a 1,200-gal. outside oil tank, each system being equipped with automatic control. A complete gas heating system, consisting of gas boiler, burners and control, would cost more than one-half as much as the other systems, and a complete coal-burning system would cost about one-third as much. The first cost of the radiation system when installed with electric heating can be reduced somewhat when used with the electric heating system and its method of operation. A pump is used for forced circulation and smaller pipes can be used.

Average Temperatures in Fort Wayne 1925-1929

Based on records of Fort Wayne branch of U. S. Weather Bureau

Year	Temperature (Deg. F.) January	February
1925	23.6	34.4
1926	27.1	30.4
1927	25.2	35.2
1928	26.8	29.7
1929	21.4	23.1

New residences can be constructed with insulation so as to give a minimum heat loss and the electric heating system installed at a total cost not exceeding ordinary construction with coal-fired heating equipment. To bring about this result chimneys, cellars and anything else specifically needed for the ordinary heating plant and storage of fuel can be eliminated.

From the Standpoint of the Public Utility

The results of the experience in heating houses with off-peak electric energy should be of real significance to the public utility as it opens a field for the sale of electrical energy of desirable characteristics. The load is ideal for it is strictly off-peak. It is of unity power factor and can, if necessary, be balanced on a two- or three-phase distribution system. With power plant equipment provided to carry the peak load safely, a peak load lasting for a few hours only and a minimum load usually about one-third of the peak, it is apparent that the utilities can generate a considerable quantity of additional energy without added plant investment. This type of load, therefore, means a more complete utilization of the equipment and a greater net income.

This field for the sale of electrical energy which is opened up is already within the existing territory and distribution system and should include from 3 to 10 per cent of the domestic customers.

In any territory, residential customers are the most numerous and return the smallest average annual revenue per customer. The development of the electric house heating equipment provides a form of load which will change a large number of the domestic consumers with their now well-known and established average yearly bill of $25 to $35 for electric energy to one ranging from $200 to $1,200 per year. This large amount of energy consumption is automatically controlled off-peak, and the off-peak hours throughout the twenty-four may

Energy Used for Electrically Heating Eighteen Houses During Past Season

October 15–May 15

House	Description of House	New or Old House	Insulation in Operation	Cubical Content Heated	Kilowatts Installed	Net Kilowatt Hours Used*
1	Brick veneer	Old	Walls and ceiling	44,840	80	122,310
2	Brick veneer	Old	Ceiling and double glass	32,499	60	85,970
3	Brick veneer	New	Walls, ceiling and double glass	28,255	50	35,695
4	Clapped frame	Old	Walls, ceiling and double glass	28,124	50	78,750
5	Stucco frame	Old	Walls, ceiling and double glass	26,250	60	70,615
6	Brick veneer	New	Walls and ceiling	22,650	40	35,833
7	Brick veneer	New	Walls and ceiling	22,400	60	51,443
8	Brick veneer	New	Walls and ceiling	21,920	60	55,146
9	Stone	Old	Ceiling and double glass	21,277	60	68,817
10	Clapped frame	Old	None	20,020	50	60,690
11	Clapped frame	Old	None	20,020	50	54,922
12	Clapped frame	Old	Walls and ceiling	15,700	40	37,800
13	Clapped frame	Old	Walls and ceiling	15,620	50	40,025
14	Brick veneer	New	Walls ceiling and double glass	14,000	30	25,222
15	Shingle frame	New	Walls ceiling and double glass	13,690	30	13,900
16	Brick veneer	New	Walls, ceiling and double glass	13,170	30	19,080
17	Clapped frame	New	Walls, ceiling and double glass	12,420	30	14,990
18	Shingle frame	New	Walls, ceiling and double glass	9,130	30	17,170

* Some variation between size of house and kilowatt-hour consumption may be accounted for by house temperatures maintained by individual householders, and other unusual operating conditions.

be selected by the utility to fit its own particular load curve.

The handling of this load, as has been stated, usually means no additional generating plant investment. In most localities the transmission feeder system will be adequate for handling this load with its off-peak characteristics because of its elimination from the usual on-peak residential load. In the distribution system the taking on of house heating loads of from 30 to 75 kw. may involve some stiffening of lines and some replacement of a number of small transformers and the substitution for them of a larger capacity transformer suitable for handling the particular house heating loads and the adjacent distribution system.

Similar to Small Industrial Loads

Before an opinion is formed as to how this type of load is to be met, the question might properly be asked, How are loads more or less similar in electrical characteristics now provided for? This load of 30 to 75 kw., at unity power factor, possible of being balanced on a two- or three-phase network and regulated on an off-peak basis can be compared (greatly to its own advantage) to a small factory or mill load. The small factory which has been burning coal, gas or oil to furnish its power requirements is at the present time an eagerly sought load in most public utility territories and adequate provision is made for serving it. The utilities are also greatly interested in substituting electric heat for other forms of industrial heat from combustion. Lines are stiffened, transformers are added in most cases without any question, and the result is a load with 60 to 80 per cent power factor and on-peak characteristics culminating at 4 to 5 p.m. on the system peak with all the other types of loads.

Electric equipment for house heating would seem to provide an ideal system with sufficient advantages to make it readily salable to at least a certain class of customer. If a rate is established which is competitive with gas, there is no question but what the electric heating systems can be as readily sold as gas.

The sale of over 100,000 oil burner equipments in 1928 is a definite index of the desire on the part of householders to obtain a convenient and automatically controlled source of heat for the house. While the operating costs of the oil burner may be lower than the electric heating, still the large volume of sales indicates a definite demand for more convenient types of house heating systems.

The availability of off-peak power for this purpose and the market for the sale of electric house heating equipments are directly interlinked. It would appear as if about 3 to 10 per cent of the domestic customers in any territory might be interested to purchase this type of house heating equipment, with all of its very desirable characteristics, even though somewhat higher in first cost than the gas equipment, and higher in operating cost than either oil or coal. This group of domestic consumers would represent a load which could be handled by the available off-peak power facilities, considering the load factor of the residential districts in most localities.

The sale of off-peak electric energy to domestic consumers for house heating purposes may present certain commercial and rate-making problems, but the use of off-peak energy for heating utilities' own buildings presents no such problems; it becomes simply a matter of sound engineering. A survey of the methods of heating utility buildings throughout the country will show heating by small, inefficient coal-burning systems, heating by gas, and heating by electric heaters on-peak. There is no question but what a careful analysis of the busbar costs of off-peak electric energy in substations or the distributed cost of off-peak electric energy delivered to a company's commercial offices will show a definite differential in favor of the use of electric energy for heating as against the inefficient burning of coal or the combustion of gas. The indicated advantages of this form of building heating, particularly for a utility company's own use, can be listed as follows:

1. It is entirely automatic. Operating costs are reduced by eliminating the handling of coal and ashes.
2. The source of heating is directly under the control of the utility and is not subject, as in the case of coal, to trucking, street, storm and strike difficulties.
3. By using its own energy, the utility sets up an object lesson to its customers.
4. Equipment is long-lived as against any other heating equipment, electrical or otherwise.
5. Saves building costs of stacks or fuel storage.
6. Eliminates hazards of open flame with possible service interruptions.
7. Eliminates investment in generation and transmission equipment of about $200 per kw. as against other on-peak electrical heating methods.

These Homes Consumed 110,000 and 37,000 Kw.-Hr., Respectively, for Heating from October to May

*Farm Yard and Building Lighting Requirements**

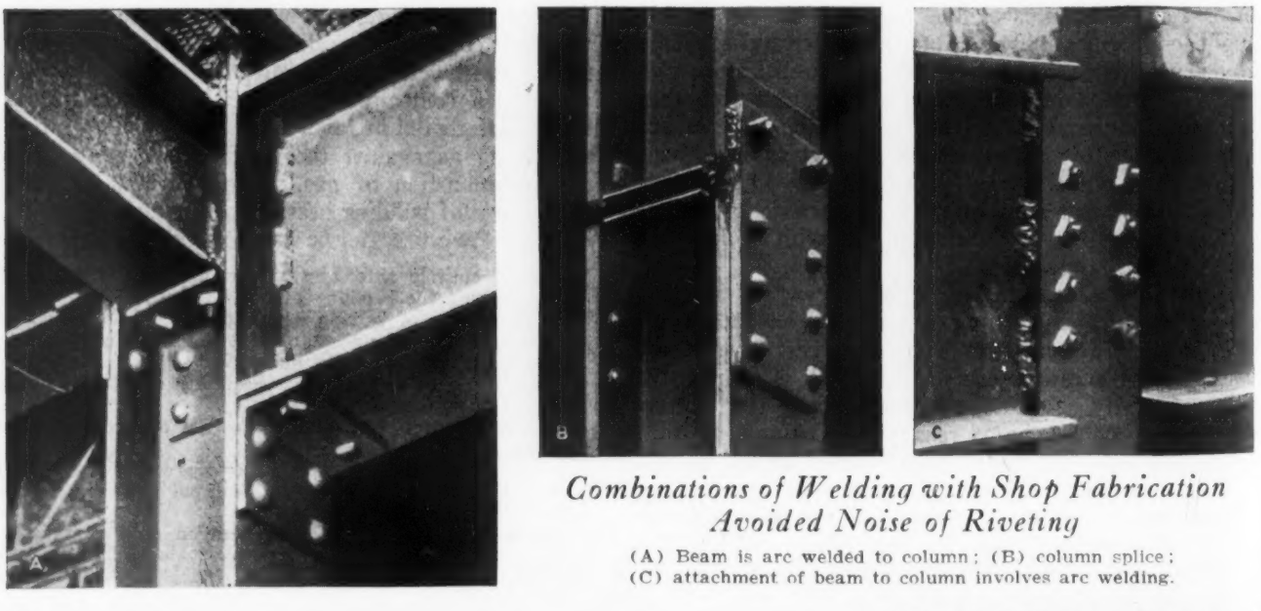
Part of Farmstead to Be Lighted	Switch Locations	Lamp Size (Watts)	No. of Lamp Units	Height	Location	Fixture
Main yard lights	Two points of control are desirable—at main entrance to house and barn.	100–150	1 or 2	15–20 ft.	From brackets at either house or barn or from pole between house and barn.	Weatherproof lamp receptacles with good reflectors necessary.
Feeding yards	At entrance to yard from building.	100–150	1 or 2	15–20 ft.	From brackets on buildings for cattle, hog or poultry yards.	Same as for main yard.
Barn	Convenient places in alleyway —One switch may control several lights.	50, spaced 20–30 ft. apart	1 for each 20 ft. of stall space	Ceiling	Over feeding alleys and at rear of stalls.	Suitable lamp receptacle. Reflectors improve illumination and efficiency.
Barn hay loft	At entrance to loft.	75–100	1	Near roof	At central part on plate or rafters.	Suitable lamp receptacles—reflectors desirable.
Milk room	At entrance.	60	1	Ceiling	Center of ceiling.	Suitable lamp receptacle—reflectors desirable.
Feed room.	At entrance.	40	1	Ceiling	Center of ceiling.	Suitable lamp receptacle.
Silo and chute.	At entrance to silo chute.	60	1	Same as chute	Top of chute.	Suitable lamp receptacle—reflectors desirable.
Granary and corn cribs.	At entrance door.	50	1 or 2	Ceiling or roof	Center of driveway—spaced 20 ft.	Suitable receptacle.
Poultry house.	At entrance door.	50	1 for each 200 sq. ft. of floor	7 ft.	Midway of front and dropping boards.	Suitable lamp receptacles—reflectors necessary when lights are used for egg production.
Hog house.	At entrance door.	40	1 for each 20 ft.	Ceiling	Along center line spaced 20 ft. apart.	Suitable lamp receptacles.
Garage.	At entrance.	60	1	Ceiling	Above hood of car.	Suitable receptacle with reflector.
Farm shop.	At entrance.	75	1 or 2	Ceiling	Over work bench and working spaces.	Suitable receptacle with reflectors.

*As compiled by the Iowa Project on Local Electrification, Frank D. Paine, supervisor.

Welding Silences Erection of Hospital Addition

PATIENTS in the Ohio Valley General Hospital, Wheeling, W. Va., were undisturbed by the erection of the steel framework for the new addition to the present hospital building because arc welding was used instead of riveting. Even the surgeons were able to perform their delicate tasks in quietness, although the operating room was within 15 ft. of the steel erectors.

While the steel structure is not entirely arc welded, due to the use of shop-fabricated beams involving riveted construction, it represents an intermediate stage of design in steel structures between the traditional all-riveted construction and the modern all-welded construction. It is estimated that the cost of arc-welding steel erection will not exceed, and in the final analysis may prove to be even less than, the cost of a steel-riveted job. Such results obtained from actual practice should encourage those who have been a trifle skeptical of the strength and economies of all-welded steel construction to attempt to obtain at least a few advantages which the new method offers. The use of a combination of riveted and welded construction will give experience and promote confidence in the electric arc-welding process. As experience and confidence are gained, the use of welded construction will continue until the transitional stage between riveted and welded construction will have ended and the efficient modern all-welded steel construction will be recognized as standard practice for virtually all steel structures.



Combinations of Welding with Shop Fabrication Avoided Noise of Riveting

(A) Beam is arc welded to column; (B) column splice; (C) attachment of beam to column involves arc welding.

Utility Income Statements
Are Analyzed

Ratios are applied to relationship existing between items in earnings statement and those in balance sheet—Income statement items are analyzed in further detail

By Robert Teviot Livingston
Assistant Professor of Mechanical Engineering Columbia University

PURSUING the study of Eastern utilities through the application of ratios, commenced in the issue of April 20, 1929, we next analyze the relations between various factors in the balance sheet and those appearing in the income statement, as well as the principal items of the income statement. In the first group are:

I. The ratio of the total revenue, including dividends, to the total assets.
II. The ratio of electric revenue to electric fixed capital plus work in progress.
III. The ratio of gross income to fixed capital plus current assets.
IV. The ratio of net income to fixed capital plus current assets.
V. The ratio of current assets to electrical department expense.
VI. The ratio of current assets to electric department expense plus fixed charges.
VII. The ratio of fixed charges plus preferred stock dividends to fixed capital and work in progress.
VIII. The earnings per share of stock outstanding.
IX. The earnings per share of preferred stock.
X. The ratio of surplus plus reserves to the gross income.

The ratio of revenue to the capital invested is always of interest in any business. It tells how rapidly the money invested in a business is used and is quite similar to the turnover ratio in other branches of business. The first ratio includes all revenues and is therefore of only general interest. The second ratio of electric revenue to electric fixed capital is of real interest.

In this analysis current assets are identified with working capital, mainly because in the reports of the various commissions, whence these figures were obtained, it is impossible to determine the working capital. As a rule, however, the error will not be large and the ratio as obtained is of interest. Returns on a rate base of about 8 per cent are fairly widely allowed, and this is shown by the third ratio. The return on the rate base after interest (ratio III) is here computed because the fixed charge ratio in the second part of this article has such an enormous spread that the conclusions drawn from it are doubtful. This ratio gives a means of checking the fixed charge ratio and is therefore of interest.

The ratio of current assets to expenses is a ratio of doubtful value. It envisages a condition existing where a company has no revenue but a continuation of the expenses. It therefore shows how long a company could thus continue in business using its current assets for this purpose. In view of the fact that materials, supplies, cash, marketable securities, etc., are all included here it might be informing, but since the money obtained from the sale of securities, etc., is charged into this account the ratio at any time may be very deceptive. If such conditions could be discounted the ratio might be of greater value.

Table I—Income Statement vs. Balance Sheet Ratios

	All Companies			Hydro			Steam			Purchase			
Ratio	Median, Per Cent or Ratio*	Range	No. of Companies	Median, Per Cent or Ratio*	Range	No. of Companies	Median, Per Cent or Ratio*	Range	No. of Companies	Median, Per Cent or Ratio*	Range	No. of Companies	Remarks
Total return on assets	18	9–27	143	...	.....	..	...	.....	..	....	.....	..	Electric companies alone, 20 per cent; with gas, 16 per cent
Return on fixed capital	20	19–37	145	18	12–20	39	26	Wide spread	27	26	24–36	34	Many much higher
Return on rate base before fixed charges	8	5–11	137	8	6–12	37	8.5	6–10	26	....	5–8	49	Very wide spread.
Return after fixed charges	3	2–7	123	3.5	1–5	42	6.5	3–9	27	6	3–8	44	Very wide spread
Working capital/direct expense	50	20–70	141	52	48–64	24	52	.....	19	40	32–48	37	.....
Working capital/expense, including fixed charges	30	20–70	134	42	36–48	28	...	36–52	20	32	.....	37	.....
Fixed charges+preferred requirements/fixed capital	4	2–6	126	...	.....	..	...	.....	..	...	.....	..	Not differentiated
Earnings per share all stock	$9	$7–$15	138	$10	$6–$15	35	$15	$5–$17	28	$10	$7–$20	38	Inconclusive
Earnings per share preferred stock	$14	$10–$22	60	...	.....	20	$14	.....	12	....	.....	13	Very uncertain, very wide range
Earnings per share after preferred	$10	$10–$22	54	$12	.....	20	...	.....	12	$20	.....	13	Very uncertain
Surplus+reserve/gross	80	30–160	142	60	40–70	39	...	30–280	30	60	30–110	58	May be much larger
Direct operating ratio	58	50–65	147	50	37–62	41	56	50–65	26	58.5	50–77	60	.....
Tax ratio	7	5–9	132	7.5	5–13	38	8	5–10	23	5	4–10	53	.....
Total ratio	67	55–72	142	56	40–65	38	64	.....	26	67	60–80	59	.....
Fixed charge ratio	...	1–16	128	8	2–28	36	10	10–16	26	6	2–10	57	Very indefinite
Times fixed charges are earned	2.4	1.6–3.3	117	1.7	1.6–2.4	29	2.2	.....	23	2.8	.....	43	Very wide spread
Times bond interest is earned	3.6	.....	94	3.2	2.0–4.0	19	3.6	.....	19	3.6	.....	22	Very wide spread
Times preferred stock dividends are earned	3	1.5–3.0	57	1.5	.....	14	4	.....	11	3	.....	20	Nothing definite

*Unless otherwise specified.

The ratio of the fixed charges and the preferred stock dividends to the fixed capital and the work in progress is of interest as it represents truly what is being paid for the moneys invested in fixed capital. The earnings per share of stock give another view of the value of a stock. This figure naturally changes with changes in operation and can materially change even though the book value or net worth remains practically constant. As in the previous article, all stock is figured as $100 par value in order to have a basis of comparison. The last ratio, surplus plus reserves to gross income, has such an enormous range that it appears useless; nevertheless, it has been used at various times.

Second Group Includes Operating Ratios

In the second group are:

I. Direct operating ratio.
II. Tax ratio.
III. Total operating ratio.
IV. Fixed charge ratio.
V. Times fixed charges are earned.
VI. Times bonds interest is earned.
VII. Times preferred stock dividend requirements are earned.

The various operating ratios here presented—I to IV—are those most generally used. The amortization is included in both the direct operating ratio and the total operating ratio. In a later article will be presented these same ratios with amortization segregated. The fixed charge ratio is of necessity quite variable as it depends upon the amount and rate of the bonds and the varying proportion of short-time obligations. In itself it means little, but taken with other ratios and with a knowledge of the company it is of value.

The last three ratios are very widely used and show the safety of investment in the various securities. In stock circulars issued by brokerage houses when selling securities these figures are usually given.

In general, it was deemed advisable to analyze these various companies on the basis of whether they were steam, hydro or purchasing companies. It is obvious that they could also be analyzed on a basis of size, but while this was done in some cases it was found that no new conclusions could be drawn, beyond the obvious one, that, generally speaking, the larger companies inclined to the better position. A further analysis on a basis of differentiation as to whether the company did a purely electrical or an electrical and gas business combined is possible. This was deemed necessary in only the one case of return on total assets. On this basis there are included in the survey 82 companies which do only an electrical business, 64 companies which do both gas and electric, nine companies which do various other business as well, or which are not differentiated.

For companies engaged in both gas and electric business the general fixed capital was apportioned on the ratio of the electric fixed capital to the total fixed capital, as were the current assets and the fixed charges, etc. This seems a logical approximation and far more so than on a basis of the revenues, since generally speaking the return in the gas business is less than in the electrical.

From these ratios the balance sheets and income statements shown in Table II were constructed. All four imaginary companies are of $10,000,000 capitalization and many interesting conclusions may be drawn from a study of them. In Table III their balance sheets are analyzed and the various ratios are computed, giving an interesting comparison which shows how difficult it is for any one company to conform to all the ratios.

In the following articles of this series the details of operation are gone into in greater length and analyzed.

Table II—Corporate Set-Up Developed for Four Companies

	Hydro	Steam	Purchase	Combined
Fixed capital + etc.	$9,000,000	$8,500,000	$9,100,000	$9,000,000
Current assets	600,000	950,000	600,000	700,000
Rate base	$9,600,000	$9,450,000	$9,700,000	$9,700,000
Other assets	400,000	550,000	300,000	300,000
Total	$10,000,000	$10,000,000	$10,000,000	$10,000,000
Common stock	$1,000,000	$1,000,000	$1,500,000	$1,500,000
Preferred stock	2,100,000	1,500,000	2,600,000	2,000,000
Total stock	$3,100,000	$2,500,000	$4,100,000	$3,500,000
Bonds	5,200,000	4,000,000	4,500,000	4,600,000
Current liabilities	900,000	1,250,000	400,000	800,000
Accrued liabilities	150,000	250,000	100,000	150,000
Retirement reserve	300,000	1,000,000	450,000	500,000
Other reserves	50,000	50,000	50,000	50,000
Surplus	300,000	450,000	400,000	400,000
Total revenue	1,620,000	1,920,000	2,210,000	2,075,000
Direct expense	$785,000	$1,050,000	$1,370,000	$1,200,000
Taxes	115,000	130,000	110,000	120,000
Total expense	$900,000	$1,180,000	$1,480,000	$1,320,000
Gross income	720,000	740,000	730,000	755,000
Bond interest	$302,000	$230,000	$260,000	$270,000
Other interest, etc.	103,000	80,000	20,000	50,000
Total fixed charges	$405,000	$310,000	$280,000	$320,000
Net income	$315,000	$430,000	$450,000	$435,000
Preferred requirements	147,000	105,000	180,000	140,000
Balance	$168,000	$325,000	$270,000	$295,000

Table III—Balance Sheet Analysis for Four Companies

	Hydro	Steam	Purchase	Combined
I		Per Cent or Ratio		
(a) Fixed capital + work + etc./total assets	90	85	91	90
(b) Bonds, stocks, etc./total assets	83	65	86	81
(c) $ bonds/$ fixed capital	0.58	0.47	0.49	0.51
(d) Stocks and bonds/fixed capital, etc.	0.92	0.76	0.95	0.90
(e) Current assets/fixed capital	6.7	11.20	6.6	7.8
(f) Current assets/current liabilities	66.7	76.0	150	88
(g) Stocks/bonds	59	62	91	76
(h) Preferred stock/total stock	68	60	63	57
(j) Accrued liabilities/total liabilities	1.5	2.5	1	1.5
(k) Book value	$130	$145	$126	$127
(l) Net worth	$165	$250	$160	$163
II				
(a) Return on assets	16.2	19.2	22.1	20.1
(b) Return on fixed capital	18.0	22.6	24.3	23.1
(c) Return on rate base	8.0	7.8	7.5	7.8
(d) Return on rate base after fixed charges	3.5	4.5	4.6	4.5
(e) Working capital/electric expenses before fixed charges	66.7	80.5	40.5	53.0
(f) Working capital/electric expenses after fixed charges	46.0	64.0	34.0	43.0
(g) Fixed charges + preferred dividends/fixed charges	6.0	4.9	5.1	5.1
(h) Earnings per share all stock	$10.15	$17.20	$10.95	$12.40
(j) Earnings per share preferred stock	$15.00	$28.70	$17.30	$21.80
(k) Earnings per share common after preferred dividends	$17.50	$32.50	$18.00	$19.70
(l) Surplus + reserves/gross	90.2	202	123	126
III				
(a) Direct operating ratio	48.5	54.6	62.0	57.9
(b) Tax ratio	7.1	6.8	5.0	5.8
(c) Total operating ratio	55.6	61.4	67.0	63.7
(d) Fixed charge ratio	25.0	16.1	12.7	15.4
(e) Times fixed charges are earned	1.8	2.4	2.6	2.4
(f) Times bond interest is earned	2.4	3.2	2.8	2.8
(g) Times preferred stock dividends are earned	2.2	4.1	2.5	3.1

20 Kw.-Hr. per Acre on Swedish Farms

IN SWEDEN the farmers have, in almost every case, had to finance the electrification of their farms, according to J. Koerner of Stockholm. Sometimes the electric power companies undertake to pay interest on the capital provided by the farmers and may take over the operation of the local low-tension distribution systems. It is estimated that in 1924 about 3,750,000 acres, or about 40 per cent of the total agricultural area, was electrified. The increase since then has been

comparatively slow, but efforts are being made to increase the consumption in order to improve the economics of the agricultural distribution systems. Experiments are being made with electric plowing, electric drying of seeds, electric hothouses, etc., which give promising results. The consumption per acre has increased from 7 kw.-hr. in 1917 to 20 kw.-hr. in 1927. The total energy consumption for this purpose is estimated at 120,000,000 kw.-hr. and is therefore of secondary importance as far as its size goes (less than that of the city of Stockholm alone), but the capital invested for this purpose is comparatively large—about $120,000,000.

Letters from Our Readers

Improvement of Appliance Standards

To the Editor of the ELECTRICAL WORLD:

I have just read the editorial in the ELECTRICAL WORLD of April 27 entitled "Are We to Have Better Appliances?" and it is indeed timely. I am sure that every reputable manufacturer in the country will appreciate the work which the Association of Edison Illuminating Companies proposes to do through the Electrical Testing Laboratories.

Both the industry and the public are in need of a clearing house in which the quality of appliances will be considered from an engineering viewpoint and with the commercial consideration given just the weight to which it is entitled—no more and no less. The only question that I think should be raised is just what standards shall be used in quality determination. Most appliance manufacturers are compelled, under the present set-up, to adopt the standards of the National Electrical Code and look to the Underwriters' Laboratories for an interpretation of that code to their particular device. Under the code the Underwriters' Laboratories have, through co-operation with the industry, developed certain standards, presumably on the basis of common sense, in which these standards are offered as a reagent capable of clarifying a solution of engineering and commercial considerations, but the appliance solution is far from clear.

To quote their own proposals, the Underwriters' Laboratories were organized "for service, not for profit," and while the industry as a whole has been benefited as far as might be expected from a proposal where one gets something for nothing, the unfortunate appliance situation as suggested by your editorial must be traceable to something, and so long as the Underwriters' Laboratories apologize for the approval of substandard apparatus by saying "that they feel compelled to approve poor-quality goods to prevent manufacturing monopolies," we can be quite sure that what the industry needs is a service that will produce a profit by, first, educating the buyer as to the necessities of real standards, and, second, by inviting competition between those manufacturers whose ingenuity is applied only to those economies which are incident to standard device production.

More than a fair proportion of the appliance volume should not be, but is, "getting by"; competition in inspection will undoubtedly better both the economies of the industry and the quality of the appliances, as well as the peace of mind of the appliance user.

G. E. PALMER,
President.
Palmer Electric & Manufacturing Company,
Waltham, Mass.

"Dancing Cables" Still Draws Interest

To the Editor of the ELECTRICAL WORLD:

I have been interested in reading the various articles appearing in ELECTRICAL WORLD from time to time on "Dancing Cables." On March 22 we had such a case on our system which kept a 66-kv. line out of service for ten hours. It involved a pole line 42 miles long with Hewlett suspension insulators using four insulators in a string, 9-ft. spacing and 300-ft. spans. The conductors are No. 2 solid copper.

The line "kicked out" at 2 a.m. and would not stay in. Patrolling was immediately started with portable searchlights, but no trouble could be found. At 9 o'clock the line was tried again, but stayed in only a few minutes. Shortly after this the writer received a telephone call that fire had been seen on this line at a certain place and, going to the place, found the wires jumping up and down in a manner almost unbelievable, causing short circuits in transposition spans. We had a small movie camera available and took pictures of the wires, but, due to poor light conditions, the film showed up so faint that the wires were just barely visible. This film is available if there is any way of bringing it out more clearly.

Sleet had been falling during the night and there was a deposit of about $\frac{3}{8}$ in. on the windward side of the wires. The wind was blowing about 40 miles an hour approximately 15 deg. across the wires. Adjacent to the spans in trouble was a 90-deg. angle, the wires in which were swinging evenly, as they usually do in high wind. The direction of the wind changed shortly afterward and the trouble ceased.

Probably there is no way of preventing recurrences of such action, but possibly discontinuance of transposition spans and substitution of transpositions on poles might help.

R. L. BOISEN,
Electrical Engineer.
Lake Superior District Power Company,
Ashland, Wis.

Effect of Motor-Starting Currents

To the Editor of the ELECTRICAL WORLD:

In the article on "Line-Start Motors," by G. R. Anderson, in the ELECTRICAL WORLD of May 4, 1929, the statement is made that "the drop in voltage caused by a motor taking 100 amp. at 40 per cent power factor is much greater than that caused by a motor taking 100 amp. at 70 per cent power factor." This is not unqualifiedly true. I think that the writer has neglected to take into account the "power factor" of the line supplying the motor. The worst drop will occur when the power factor of the line and that of the starting current of the motor are the same. A few minutes with a vector diagram will demonstrate this. For instance, if the resistance and reactance of a line are about equal the "power factor" of that line will be about 70 per cent and the drop due to starting a motor at 70 per cent power factor will be greater than, rather than less, that due to starting a motor with the same starting current at 40 per cent power factor.

I think this detracts somewhat from the significance of the proposed unit standard of measure for line disturbances, since it upsets the premise upon which this standard is based; i.e., that the disturbance is inversely proportional to the power factor. From unity down to the "power factor" of the line in question this relationship holds; below that point the converse is true.

K. M. SMITH.
Distribution Division.
Commonwealth Edison Company,
Chicago, Ill.

Digest of Electrical Literature

Transmission, Substations and Distribution

Metal-Arc Rectifier.—P. TOULON.—If an electric arc is established between two electrodes and a third electrode is brought within the flame zone of the arc a direct current can be made to flow between this third pole and either of the two other electrodes. Based upon this principle, which is the basis of an American patent by Murphy, 1909, experiments were conducted which have culminated in a commercial rectifier for up to 100 kw. Compared with the well-known mercury-arc rectifier, this new metal electrode type has the advantage of allowing readily a voltage regulation within wide limits, is much simpler in its design and requires no vacuum. Its efficiency in the 100-kw. size is 94 per cent. Its only disadvantage is the limited life of the metal electrodes.—*Revue Générale de l'Electricité*, March 30 and April 6, 1929.

A 70,000-Volt System in the Tropics.—The steadily increasing use of electricity by both private individuals and industrial undertakings in the larger towns on the island of Java, Dutch Indies, and the expansion of the electrical supply systems to even the smallest towns and districts has greatly augmented the demand for electrical energy. As the Dutch Indies is without the advantages of coal fields, there are but a very few steam power stations and these are only to be found in a few larger towns on the coast, as, for instance, Soerabaya and Batavia. An important step in the electrification of Java was the construction of hydro-power stations and the erection of an extensive 70,000-volt network in West Java for supplying Batavia, Buitenzorg and the surrounding district, and also the electrified main railway line Tandjoing Priok-Batavia-Buitenzorg. Further, there are a number of state-owned hydro power stations in West Java, near Bandoeng, operating at 25,000 volts.—*Far Eastern Review (China)*, March, 1929.

Units, Measurements and Instruments

Station for Short-Circuit Tests.—A. ROTH.—For the testing of its oil circuit breakers, a large French manufacturing concern erected a high-current testing station equipped with the most modern generating and measuring apparatus. A three-phase, 50-cycle synchronous generator of 50,000 kva. continuous output at 6,000 volts is driven by a 1,350-hp., three-phase motor of 1,500 r.p.m. The motor can furnish up to 2,700 hp. for ten minutes. A 30-hp. starting motor is geared to the set. The reactance of the generator is 0.195 ohm per phase, which gives a sustained short-circuit current of 27,000 amp. or a peak value of 68,000 amp. The short-circuit energy is therefore about 530,000 kva. The stator winding is arranged in two halves, so that the above given current values can be doubled for the two halves in parallel instead of series at half the voltage. The bearing friction losses of this set amount to 320 kw. Three current-limiting reactors are available to adjust the resulting short-circuit current. If tests at higher voltage are to be made, a special 92-ton, three-phase testing transformer is provided, with a reactance of only 0.02 ohm, giving on the high-voltage side 15,500 to 107,500 volts in six steps. For tests with lower voltage auxiliary transformers are available, furnishing as high as 250,000 amp. at 90 volts. It requires about eight minutes to start and synchronize the set. During the actual short-circuit test the driving motor is disconnected from the supply. Two oscillographs of the triple vibrator type and one recording pressure meter are installed. The tests themselves are conducted in a bomb-proof yard, surrounded by heavily reinforced concrete walls and covered by a roof of light construction. *Révue Générale de l'Electricité*, January 12, 1929.

Illumination

Modern Floodlighting of Public Buildings.—W. M. CALLAHAN.—Architectural beauty of State Capitol enhanced by installation costing only $6,845. Daily operating cost, including energy, upkeep, depreciation and interest, only $7.44. Modern floodlighting is assuming increasing importance in the commercial field as well as contributing toward a wider appreciation of the beauty and architectural design of public buildings and civic centers. Keeping abreast of the national trend, the State of California has completed the floodlighting of the upper portion of the Capitol at Sacramento.—*Electrical West*, May 1, 1929.

Good Commercial Lighting.—ROBERT L. ZAHOUR.—In accordance with the generally accepted understanding, the subject of commercial lighting as covered includes private and general offices, drafting rooms and the interiors of department stores and small retail stores. The general principles are considered in the planning of lighting for those particular applications. These principles are equally appropriate for school buildings, libraries and interiors of like nature. In the design of the lighting installation offices and stores have the same essentials. The same types and styles of luminaires were used, with the exception that more attention was given to the decorative designs of luminaires for a store and for an office installation. Besides, the desirable intensity of illumination in stores varies considerably with its exclusiveness and the kind of merchandise displayed, while all offices can be lighted with approximately the same equipment.—*Electrical Record*, May, 1929.

Heat Applications and Material Handling

Electric Welding Machines.—The advantages of using welds instead of other types of joint for connecting both similar and dissimilar metals are now so widely recognized that it is not surprising to find that this process is being increasingly employed in the production of articles for a great variety of industrial purposes. The heat necessary to effect the weld can be generated in more than one way, and at the present time electricity is employed on a large scale, owing to its convenience and the fact that it can be employed in conjunction with relatively unskilled labor. A natural corollary of both of these conditions is that close attention is being paid to the design of electric welders, with a view to obtaining ease of operation in combination with strength and reliability of the finished work.—*Engineering (England)*, April 12, 1929.

Telegraphy, Telephony, Radio and Signals

A Portable Radio Intensity-Measuring Apparatus for High Frequencies.—J. HOLLINGWORTH.—A description of a high-frequency radio apparatus capable of measuring in absolute units the intensity of the electromagnetic field over the frequency band of 5 to 12 megacycles per second. It is easily portable, since the total weight without batteries is only 60 lb. An untuned antenna, which is coupled to the grid of the detector valve in an unusual manner, is used to pick up the energy to be measured. Sensitivity is not seriously affected, since the range of intensities which can be measured is from 10 microvolts per meter to 10,000 microvolts per meter. The screening difficulty is lessened by using a resistance attenuator and toroidal inductances and by totally disconnecting the aerial during calibration. The set consists of a detector valve with which is associated a control valve. One stage of audio-frequency amplification follows the detector, and a diode used as a second detector allows a galvanometer to be used for the signal comparison. A separate heterodyne is used to obtain the audio frequency. A resistance method is used to attenuate the current from the local source. The complete apparatus has been subjected to a series of tests in self-consistency and absolute value.—*Report the Institution of Electrical Engineers (England)*, May 1, 1929.

Building Electric Range Volume in a Texas Natural Gas Territory.—R. B. NIESE, JR.—A total of 1,320 electric ranges sold in 108 cities, towns and communities in 1928, notwithstanding the fact that more than 80 per cent of the customers reside in natural gas territory, is the record set by the West Texas Utilities Company. It might be of especial interest to disclose that this record was made without the assistance of a corps of high-powered specialty salesmen from factories or jobbing houses. Only one jobber representative worked on the company's properties during the year. This record was established by, first, establishing a range quota for each of the ten districts covering the 42 counties in the western part of the state. Then a campaign of attractive and convincing advertisements pointing out the economy of electrical cooking, its simplicity, cleanliness and safety was started and then the employees from every department of the company volunteered their aid in putting the job over.—*Electrical South,* May, 1929.

Hydro-Electric Development and Steam Equipment

Heat-Insulation Practice in the Modern Steam-Generating Plant.—L. B. MCMILLAN.—A brief outline of the engineering principles of heat-insulation design. Special emphasis is given to the fact that the heat dissipated by so-called "radiation" losses is from the most valuable portion of the heat and that these losses frequently result in the lowering of heat potential or temperature head, with a resulting loss in the value of all of the heat as measured by its remaining effectiveness. A distinction is drawn between the cost of average heat and the value of a particular portion of the heat in terms of what it will accomplish in the way of useful results. Results accomplished by the insulation of various units of power plant equipment are discussed and typical installations shown.—*Mechanical Engineering,* May, 1929.

Electrophysics, Electrochemistry and Batteries

A New Seismometer Equipped for Electromagnetic Damping and Electromagnetic and Optical Magnification.—FRANK WENNER.—An elementary discussion is given of the principles involved in the functioning of seismometers equipped with electromagnetic damping and electromagnetic and optical magnification. These principles are used in the development of an equation giving the relation between angular displacement of the winding of the galvanometer and a linear displacement of the ground. This equation, which is a linear differential equation of the fourth order, contains terms representing the reaction of the galvanometer, upon the motion of the steady mass of the seismometer, a point which has previously been effected and which is of importance unless the seismometer is made much larger than that for which there is any need. A solution of this equation is given for the case of a sustained harmonic displacement of the ground. Also, the corresponding equation and solution are given for the case of tilting of a horizontal component instrument—*Department of Commerce, Research Paper No. 66,* May, 1929.

Electrons and Quanta.—C. J. DAVISSON.—A brief description of experiments from which the wave properties of electrons are adduced. The agreement between the results of these experiments and the prediction of L. de Broglie is pointed out. The wave and corpuscular properties of electrons are compared with the similar properties of light quanta.—*Bell System Technical Journal,* April, 1929.

Alloys of Iron, Nickel and Cobalt.—G. W. ELMEN.—If the three ferromagnetic metals, iron, nickel and cobalt, are melted together in various proportions, all of the resultant alloys are magnetic when the materials used are reasonably pure. The magnetic properties of the alloys, however, vary greatly with composition and heat treatment. Some alloys have been found to be nearly non-magnetic; others have higher permeability than any hitherto known magnetic material and may be magnetically saturated in the earth's field. Still others are superior at high field strengths or excel in constancy of permeability at low fields. —*Journal of the Franklin Institute,* May, 1929.

Traction

Cross-Andes Railway—E. SCHROEDER. —The middle part of the 875-mile South American railway between Valparaiso and Buenos Aires (the 73-mile stretch over the Andes) is electrified and operates its trains (two freights per day and two passenger trains per week) over adhesion and cog rail sections. A 3,000-volt direct-current system has been chosen, with heavy twin locomotives of type 1 + C + C + 1. Each twin engine carries six identical motors of 235 kw. output, four of them for the six driving axles and two for the two cog wheels. Maximum grades as established for both adhesion and geared section operations, with a full 200-ton train weight, are handled by the locomotives at 25 and 10 m.p.h. respectively. To avoid excessive strains upon the cog wheels an automatic slip-clutch is interposed between cog wheels and motors. Special synchronizing provisions are necessary for the cog wheel motors when entering the geared section. The electric operation of the motors is in series parallel groups with a pair of motors always in series. On the geared sections all six motors are driving.—*Brown, Boveri Mitteilungen,* April, 1929.

Miscellaneous

Power-Equipment Schedule Simplifies Complicated Circuits.—When the power feeder system is extensive, a schedule should be provided as a means of easily identifying the different circuits. Such a schedule should give a complete record of all the circuits in the plant. It should show how the circuits run, the size and number of conductors and whether they are run in conduit or open; if in conduit, the size of the conduit should be specified. Such a schedule should also include the motors, their size and location and what they drive. Other information, such as the location of the motor controllers and switchboards and any data necessary for the complete record of the power circuits, should be part of the schedule. A power equipment schedule has many uses. It gives the plant engineers a complete picture of the system the plant is serving. In the case of trouble on the system that is reflected back into the power plant, the engineer may notify a repair gang on what feeder the trouble is and what it serves.—*Power,* April 16, 1929.

Aluminium Castings.—EDGAR T. PAINTON.—While aluminium is now firmly established as the metal par excellence of which we make many component parts of automobiles and their engines, and indeed the attainment of the modern standard of excellence is coincident with the increasing use of aluminium and its alloys, manufacturers of electrical plants do not fully appreciate that many of the reasons which justify the use of aluminium in the automobile trade apply similarly to their own industry. Aluminium as an electrical conductor is, of course, well established, but at the moment we are not concerned with its use for overhead lines or for busbars. The main advantages of aluminium are, first, its lightness, and, secondly, its cheapness.—*Electrical Review (England),* April 26, 1929.

Using a Space Factor Basis for Figuring Wire Sizes.—OTTO WIEMER.—Because Section 614-e of the 1928 National Electrical Code allows the use of a common neutral for several feeder circuits, there is urgent necessity for a suitable table for determining conduit sizes for different combinations of wires. For combinations not included in Tables I, II and III, Section 503-q, the National Code leaves the choice of conduit sizes to the authority enforcing the code and recommends that a space factor of 40 per cent be not exceeded. In California this situation has been met very satisfactorily by using Table 703-3(b) in the Electrical Safety Orders of the State Industrial Accident Commission, but this table is based on a space factor greater than 40 per cent and gives results that do not always agree with the present recommendations of the National Code. The table given was planned with the primary idea of producing a convertible table for wires of different sizes.—*Electrical West,* May 1, 1929.

News of the Industry

Program Now Complete

Elmer A. Sperry Added to List of Speakers at Atlantic City—Two More Addresses for Accounting Session—Committee Meetings

ANOTHER speaker in the person of Elmer A. Sperry, this year's president of the American Society of Mechanical Engineers and an engineer of international fame, has been added to the program for the N.E.L.A. convention at Atlantic City next week. Mr. Sperry will speak at the third general session on Thursday morning, when his topic will be "The Birth of the Industry."

For the Accounting Section's meeting on Tuesday afternoon two new addresses have been provided. One of these will be by W. Alton Jones, first vice-president Cities Service Company, New York, his topic being "Accounting and Modern Business." The other will be on "The Trend of the Times" and will be made by David Lawrence, president *United States Daily* and a widely known author and journalist.

Committee meetings on Monday morning and afternoon include the women's committee, to which all women members of the N.E.L.A. are invited; the executive committees of the national body and the four national sections, and the committees on accident prevention, rural electric service and rate research. On Tuesday luncheon meetings of the committee on steam railroad electrification, the geographic division secretaries, the statistics committee and the regional directors of the National Food Preservation Council will be held; on Wednesday the Class D members will meet at 12:30 p.m. and the state public utility information directors will hold a luncheon meeting, and on Thursday there will be a luncheon meeting of the public policy committee.

Edison Fellowship Established by General Electric

In honor of Thomas A. Edison and in commemoration of the fiftieth anniversary of his incandescent lamp, an Edison fellowship for research in the General Electric research laboratory at Schenectady, N. Y., has been established. Its object is to help determine the fitness of a candidate to undertake industrial or scientific research by arranging for a year's research in that laboratory. The opportunity will be given to the selected candidate who has adequate training and who has done sufficient original work to indicate a real aptitude for research. The year's fellowship carries a grant of $3,000. The selection from applicants will be made by the National Research Council with the advice of the director of research of the General Electric Company.

More About the "Golden Jubilee" Postage Stamp

Further information on the new 2-cent postage stamp issued to commemorate the fiftieth anniversary of the production of the incandescent lamp invented by Thomas A. Edison has been given by Postmaster-General Brown. The new stamp will be the same size as the standard 2-cent stamp and will be printed in red ink. The design represents the original lamp with rays of light issuing therefrom. Immediately above and partly encircling the lamp will be a ribbon with the words "Edison's First Lamp." At the top will be a semi-circular panel displaying the words "United States Postage" in white roman letters.

In both corners there will be ribbon scrolls with the year "1879" at the left and "1929" at the right. On either side of the lamp and through the rays of light will appear the following legend: "Electric Light's Golden Jubilee." The white numeral "2" will appear in both lower corners within shaded circles, which will be connected by a panel forming the base of the stamp and containing the word "Cents" in white Roman letters. The Edison commemorative stamp will first be placed on sale on June 5, at the post office at Menlo Park, N. J. The stamps will be available at other post offices as soon thereafter as production will permit.

Medallion Which Will Mark Light's Golden Jubilee

THIS is the medallion referred to last week (page 1069) which was designed by Franklin Booth and has been adopted officially for "Light's Golden Jubilee" to commemorate the fiftieth anniversary of the invention of the incandescent lamp by Thomas A. Edison.

Hell Gate's New Units Are Dedicated to Service

Brown-Boveri and Westinghouse 160,000-Kw. Turbo-Generators Are Viewed by Prominent New Yorkers and Visiting Utility Officials

MORE than 420,000 hp. was added to electric light and power facilities of Greater New York on Wednesday of this week, when two new turbo-generators, one a Westinghouse unit, the other an American Brown-Boveri unit, each of 160,000 kw. rating, were dedicated at the Hell Gate station of the United Electric Light & Power Company, between East 132d and East 134th Streets. The dedication was attended by public officials, representatives of civic organizations, technical bodies and visiting public utility officials from other states to the total number of about four hundred, who were conducted over the plant by officers and employees of the company. A buffet luncheon was served.

With the addition of these two units to its facilities, New York City is said to have more than half the installed capacity of New York State. The capacity of all the electric light and power companies in the state is 4,375,000 hp.; that of the five companies in Greater New York is 2,370,000 hp. An article descriptive of the Westinghouse unit appears in this issue of the ELECTRICAL WORLD (page 1089). The Brown-Boveri unit was described on March 30 (page 625).

Matthew S. Sloan, president of all the combined companies, made an address of dedication. In part Mr. Sloan said:

> This organization is chartered to supply to the people a necessity of modern life affected with a public interest. It must ever advance, making its service better and broader, reaching new territory yet unserved, taking on new customers, showing existing customers how to get greater value from the use of electricity. It must plan and build its plants and distribution facilities years ahead of immediate needs so that customer demand and community growth may never find the supply of electricity lagging. These things it should do as a business. Still more must it do them because it is an agency of public service.
>
> The degree to which we make progress, to which we meet our obligations of public service, is the precise measure of our value in our job. You, the public, pass final judgment on that. That is why you were invited here today, so you might see how we work out this job you have committed to us; so you might inspect some of the equipment engaged in your behalf; so you might, perhaps, form a clearer idea of the kind of organization this is on which you depend for light and power.

William A. Prendergast, chairman New York Public Service Commission, gave an address on the contributions of the power industry to national welfare. He quoted the report of the committee on recent economic changes to show that the use of power had contributed greatly to economic and social welfare. He stated that the striving for accomplishment was characteristic of the power industry and said its leaders had the spirit of true public service.

George B. Cortelyou, president of the Consolidated Gas Company, said that occasions such as the one at which he was speaking meant not only the dedication of new and better equipment but a rededication of utility men to public service. The machines represented concrete accomplishments, but they symbolized also progress and public service.

Want Expert Commission to Advise Seattle

An expert commission to give advice to the Seattle City Council, the light department of that city and the city engineering corps on the development of the Skagit power plant is recommended by a special investigating committee which reported to the Municipal League recently. The report calls attention to the fact that the Skagit development now represents an investment of almost $24,000,000 in actual outlay and under contract and that the future development may run to $50,000,000 more.

"Without any reflection on the personnel of the light department or the engineering department, it is believed that these departments would be strengthened and made more effective by the employment of an engineering commission to develop policies and further development of the Skagit project and to advise the Council of the economic phases of that development, including the cost of production and prospective need of power," the report reads. During 1928, it asserts, the light department paid out $2,112,070 on principal and interest on bonds. In 1929 the total will increase by $475,000; in 1930 there will be a further slight increase, and in 1931 an increase of $170,000 over 1930, while in 1932 the report shows that payments will amount to $2,190,192. to which must be added $75,000 interest on bonds already sold this year and interest on new bonds.

Opposed to this report, which was filed by Nelson R. Anderson, chairman of the Municipal League, and six other members of the committee, is a report by a minority committee, which disagrees in many points with the Anderson report.

To carrying forward the Skagit project, the City Council has passed an ordinance authorizing the Board of Public Works to draft plans and specifications and award contract for construction of a 2,100-ft. tunnel from the Diablo Dam, now building, to the site of the proposed Diablo power house on Reflector Bar. The tunnel is estimated to cost $1,000,000.

Alabama Power Company and Mobile "Press"

Federal Trade Commission Investigation Shows No Financial Investment by the Utility, Although Officials Welcomed Establishment of Paper

OFFICIALS of the Alabama Power Company favored but did not finance the newly established Mobile *Press*, according to T. M. Stevens, a Mobile attorney, who testified on May 23 in the Federal Trade Commission's public utility investigation. For some years past, Mr. Stevens declared, the F. I. Thompson newspapers had enjoyed a monopoly in Mobile which had become increasingly unsatisfactory to many of the citizens. There had long been sentiment favoring the development of a new local paper, and this brought to a head a conference last October.

Representatives of the Alabama Power Company and of a Southern subsidiary of the International Paper Company had met to draw up a power contract in connection with a local paper-mill development. Plans were being discussed for the expenditure of large sums on a general development program to put Mobile on the industrial map. Mr. Stevens, attending as counsel for the International, asked T. W. Martin, president of the power company, what he thought of the hostile press situation. In the course of the conversation, Mr. Martin suggested that Victor Hanson, editor of the Birmingham *News* and the Birmingham *Age-Herald*, might know of a good man to start an independent news organ. Acting on this suggestion, Mr. Stevens saw Mr. Hanson, who recommended R. B. Chandler, now editor of the new Mobile *Press*.

In financing the enterprise, the cost was estimated at $215,000, so the capitalization was made $250,000 to cover contingencies. Half the capital stock was subscribed locally, no one person holding more than $5,500 worth. Mr. Chandler took the other half, borrowing $100,000 from J. F. McGowin, a Mobile lumberman and capitalist with no utility connections. The stock was then transferred to a voting trust of five men and tied up for a ten-year period so that rival newspaper interests could not buy in and thus maintain a close touch with the business management of the new publication.

The Alabama Power Company adopted a hands-off policy during these transactions. Mr. Stevens quoted Mr. Martin as saying that he felt it unwise to invest in newspaper property either personally or for his company. It was denied that the McGowin loan came from utility sources. Mr. Stevens declared that the International Paper Company had taken no part in the affair. As for his own conections, he pointed out that he has acted against the Alabama Power Company in more than one lawsuit.

Following the testimony of Mr. Stevens, Counsel Healy introduced exhibits dealing with various phases of alleged propaganda by power utilities.

Colonel Ira C. Copley, owner of newspapers in Illinois and California, who requested a hearing to deny alleged stock holdings in utilities, will appear before the commission on June 13.

Jersey Central P. & L.'s Coming Station

South Amboy Plant Now Under Construction Will Embody Several Unusual Features—Initial Rating of 50,000 Kw.—1,400-Lb. Pressure

EXCELLENT progress is reported on the 50,000-kw. steam-electric generating station which the Jersey Central Power & Light Company has started to build at South Amboy, N. J., and it is expected that it will be in operation about the last of April, 1930.

The initial installation in the South Amboy plant will comprise two 25,000-kw. compound turbo-generators, and provision will be made for an ultimate capacity of 270,000 kw. The boilers, of which there will be three, will be operated at 1,400 lb. pressure and the turbines at 1,250 lb. The new station will embody a number of innovations in generating-plant construction, among which will be "steeple-compound" turbines—that is, self-contained machines built with the high-pressure element on top of the low-pressure element—multiple-unit pulverizers with zone combustion control, bent-tube condensers with the tubes rolled into the sheets, five-stage feed heating and probably heaters of the direct-contact type.

Other features of the plant will be a 33,000-volt outdoor substation, intake and discharge waterways, and a dock on the Raritan River for receiving coal and other supplies arriving at the plant by barge or boat.

Within the plant building the turbine, boiler and electrical control rooms will be on the same level, the pump and pulverizer rooms on another level. The heaters and station auxiliary control room will be on a mezzanine floor and the 13,200-volt switching room above the station auxiliary control room.

The building will be square in design and will have a central entrance and foyer, approached by an ornamental bridge to be built over the intake canal. It will face the highway and the tracks of the New York & Long Branch Railroad, whose trains carry thousands of commuters to and from New York City and other metropolitan points each day. The grounds will be attractively landscaped. The exterior walls will be of brick with concrete water tables, and the front wall will be finished with tapestry brick trimmed with granite.

Nebraska State N.E.L.A. Meets at Scottsbluff

The annual convention of the Nebraska State Section, N.E.L.A., was held at Scottsbluff on May 24. A report of this meeting will appear next week.

Electrochemists in Canada

Electrolytic Generation of Hydrogen and Oxygen Proposed as Providing a Market for the Off-Peak Power of Base-Load Stations

UNDER the title of "The Baseload Central Station and Its Future Relation to the Electrochemical Industry," an especially interesting paper was presented before the Toronto convention of the American Electrochemical Society on Monday of this week by Farley G. Clark of the Canadian city. The author attempted to prove by economic analysis that utility companies with modern base-load stations might be able to utilize their investment to considerably better advantage if they would sell their off-peak power, when, as and if available, at rates which would just cover the increment cost of operation plus a profit. As providing a market for this power he proposed electrolytic generation of hydrogen and oxygen, the former element to be used in making synthetic ammonia.

Data were presented to indicate that surplus power can be generated at 1.2 to 3.5 mills per kilowatt-hour with coal costing $2 to $6 per ton, permitting hydrogen to be produced at 22 to 44 cents per 1,000 cu.ft. With hydrogen at 50 cents per unit the author claimed that synthetic ammonia could be made for $80 per ton and shipped in tank cars at $10 per ton or less. The United States market for fixed nitrogen will be more than 400,000 tons a year by 1935, he prophesied.

Another paper dealing with a rapidly growing electrochemical process was on "Cadmium Electroplating from Cyanide Baths," by L. R. Westbrook. A group of papers on the electromagnetic properties of conducting solutions may throw light on previously unexplained phenomena.

Dr. Francis C. Frary, director of research for the Aluminum Company of America, New Kensington, Pa., was elected president in succession to Paul J. Kruesi of Chattanooga, Tenn.

In all 33 technical papers were presented, which might be grouped under "electromagnetic characteristics of electrochemical processes," "industrial topics," "teaching methods," "electrodeposition" and "scientific topics."

Inspection trips were arranged to the Oshawa plant of the General Motors Company, a rubber factory, the International Nickel Company and other industrial establishments.

Pocket Veto of Muscle Shoals Bill Will Stand

Hopes cherished by Senator Norris and others that President Coolidge's pocket veto of the Muscle Shoals bill passed by the last Congress at the end of its first session and not reintroduced at the final session, which ended on March 4, would be upset by the United States Supreme Court, before which a similar veto of a bill affecting the rights of the Okanogan Indians had been brought for a decision as to its constitutionality, were destroyed when on Monday, May 27, the court handed down a decision sustaining the President's action in the case last mentioned.

The point at issue was whether the constitutional clause under which a bill sent to the President less than ten days before the adjournment of Congress and not returned by him to that body fails to become a law is operative when the session about to adjourn is a first or interim session or only when it is the final session of the Congress concerned. Had the contention of those bringing the action that pocket vetoes are effective only when the Congress is about to dissolve been sustained, the Norris Muscle Shoals resolution providing that the government should operate the plants owned by it would automatically have become law.

Pointing out that there are on record 119 instances in which presidential pocket vetoes affected bills passed at a session other than the final one of a Congress, the Supreme Court said:

> Without analyzing these 119 instances in detail, we think they show that for a long series of years, commencing with President Madison's administration and continuing until the action of the House committee of the whole in 1927, all the Presidents who have had occasion to deal with this question have adopted and carried into effect the construction of the constitutional provision that they were prevented from returning the bill to the House in which it originated by the adjournment of the session of Congress, and that this construction had been acquiesced in by both houses of Congress until 1927.

Senator Black Reintroduces Muscle Shoals Bills

In view of the decision of the Supreme Court in the case involving the pocket veto, Senator Black of Alabama has reintroduced the bill containing the offer of the American Cyanamid Company for the Muscle Shoals properties of the government and the bill containing the offer of the Farmers' Federated Fertilizer Corporation. He also has requested Senator Norris of Nebraska to reintroduce his bill providing for government operation of the power plant at Muscle Shoals. He urged that the committee on agriculture take up the active consideration of these bills looking to action on them before the end of the special session.

"We should show the United States and its people," said the Alabama Senator, "that this Congress can legislate with reference to Muscle Shoals in spite of the opposition of the great organized power trust and of the fertilizer trust."

Senator Black also inserted in the *Congressional Record* an article appearing in a Florence (Ala.) newspaper, in which it was contended that 97.979 per cent of the available power at the Wilson Dam was wasted during April. The article continued to say that there is no available market for the large amount of power going to waste and fertilizer production would provide one.

In the Legislative Mills

ILLINOIS.—An amendment to Representative O'Brien's utility measure gives companies the right to sell power to municipalities at wholesale rates. Another amendment adopted prohibits utility companies from giving service to employees at a reduced rate.

A bill on third reading in the House, having passed the Senate, authorized cities to lease any public utility for a period not to exceed 25 years, on terms prescribed by ordinance, to the Inland Waterways Corporation or any other corporation owned or controlled by the United States government.

Another House bill authorized the department of purchases and construction to sell or lease perpetual easements to public utilities to place conduits, cables, gas and water mains in tunnels constructed as an appurtenance to the Illinois Waterway, proceeds to go to the waterway fund.

The House committee was considering a bill passed by the Senate authorizing cities having a population not over 30,000 to sell public utilities owned by them and validating sales heretofore made. A reparations bill, providing that if the commission finds a public utility has charged an excessive rate it may order the utility to make reparation, failed to pass the House, where it originated. Other bills affecting utilities were tabled.

It is generally conceded that the many utility bills now lying in committee are dead.

MISSOURI.—Prior to its final adjournment on May 25 the Legislature passed all but one of the bills sponsored by the St. Louis Rapid Transportation Survey Commission. The lone measure that was lost was one providing for excess condemnation for public improvements. Bills passed and sent to Governor Caulfield are the terminable-permit bill, an enabling act authorizing municipal acquisition of public utilities and a third bill providing for an amendment to the constitution to permit the issuance of public improvement bonds for a period of 50 years instead of 20 years. The last-named act would apply to any community of 5,000 population or more. The enabling act and the bond issue bill will be submitted to the voters in November, 1930.

American Papers for Tokyo

Latest figures from Maurice Holland, executive secretary of the American committee for the World Engineering Congress to be held at Tokyo in October and November, show that more than two-hundred engineers from all parts of the United States have made reservations to attend the sessions. The subjects of some of the papers to be contributed by men from the United States have been announced. Elmer A. Sperry, chairman of the American committee, will talk on "Recognition of the Engineer and the American Engineering Society."

Other American papers scheduled include: "Lightning," Frank W. Peek, Jr.; "Extra-High-Voltage Transmission," J. P. Jollyman and E. R. Stauffacher; "Scientific Industrial Management," L. P. Alford; "American Power-Station Electrical Equipment," F. D. Newbury, W. J. Foster and Philip Torchio; "Interconnection of Electric Systems," Farley Osgood, P. M. Downing, W. E. Mitchell and E. C. Stone; "Economic and Operating Considerations in Railroad Electrification in the United States," Dugald C. Jackson; "Refrigeration in the Preservation of Food," Harden F. Taylor; "Safety in Dam Construction," Allen Hazen, and "Development in the American Coal Industry, 1913-28," George Otis Smith and F. G. Tryon.

Purchases and Mergers

Empire Public Service Company Buys Three More Ohio Utilities—Merger of East Tennessee Properties Approved—Virginia Property Changes Hands

BESIDES taking over as part of its system the Toledo, Bowling Green & Southern Traction Company, which supplies electric light and power in Findlay, Ohio, and its vicinity (ELECTRICAL WORLD, April 6, page 700), the Empire Public Service Company of Chicago has added to its system the North Baltimore Service Company, the Rudolph Light & Power Company and the Wooster Electric Company, all Ohio concerns serving the communities indicated by their names. Of these the last named, which supplies not only the city of Wooster, but also Apple Creek, Shreve and sixteen other towns, is the largest. The Empire Public Service Company has also taken over the management of the Western Ohio Railway & Power Corporation, which serves Wapakoneta, Rawson, Beaver Dam and many other towns with light and power.

Approval of the merger of nine east Tennessee power companies owned by the Doherty interests into the Tennessee Central Service Company (ELECTRICAL WORLD, May 18, page 992) has been given by the state Railroad and Public Utilities Commission. The nine companies are the Bristol Gas & Electric, Tennessee Eastern Electric, Elk Park Light & Power, Erwin Light & Power, Butler Light & Power, Newland Light & Power, Roan's Creek Light & Power, Bluff City Light & Power and the Watauga Power. The common stock of the Johnson City Traction Company is also included in the transaction. In effecting the merger pending suits against the state commission by the Tennessee Eastern Electric Company and the Johnson City Traction Company in rate and securities cases were ordered dismissed upon the request of the power company.

Controlling interest in the Loudoun Light & Power Company of Purcellville, Va., has been acquired by the American Water Works & Electric Company of New York by an exchange of stock of the latter for stock of the Loudoun Light & Power. The American Water Works & Electric Company controls the Potomac Edison Company and the Northern Virginia Power Company. From the latter, serving Winchester, Va., the Loudoun Light & Power now purchases electricity.

Stockholders of the Cincinnati, Newport & Covington Light & Traction Company have received letters offering them exchanges of their securities for those of the Columbia Gas & Electric Corporation, which at present holds a long-term lease of the first-named company. The Newport & Covington Light & Traction is the holding company for the Union Light, Heat & Power Company of Cincinnati.

Felderman Brothers & Hayes have sold the lighting system at Lamotte, Iowa, to the Iowa Electric Company, from which energy has heretofore been purchased.

Voters of McCracken, Kan., at a special election June 11, will decide whether to sell their municipal power plant to the Western Light & Power Corporation.

Announcement has been made at Hopkinsville, Ky., that the Kentucky-Tennessee Light & Power Company has bought the light and power plant of A. P. White & Company at Cadiz, Ky., for about $180,000, including other property.

A certificate has been filed in the office of the Secretary of State at Albany, N. Y., under which the New York State Electric Corporation merges the Tri-County Light & Power Company of Schoharie, Greene and Delaware Counties.

As told under "Financial and Statistical News" (page 1126), the Commonwealth & Southern Corporation has been formed by the Bonbright interests of New York City, including the American Superpower Corporation, to acquire working control of three public utility systems whose assets exceed $1,042,000,000. It will, the announcement says, own more than 40 per cent of the common stock of the Commonwealth Power Corporation, the Southeastern Power & Light Company and the Penn-Ohio Edison Company.

Formal franchises for the light and power services in the city of Alberni and Port Alberni, British Columbia, have now been awarded to the National Utilities Corporation of Spokane, Wash. The Port Alberni power plant has been purchased for $125,000 and the Alberni municipal plant for $8,000.

Engineering Foundation Endowment Gets Good Start

The Engineering Foundation has raised $720,000 of its proposed endowment fund of $5,000,000, and officials of the foundation have received assurances of future gifts, ranging from $20,000 to $500,000, through legacies, annuities and trusts. This was announced at a dinner meeting of the organization last week in New York.

It was also announced at the dinner that James H. McGraw, chairman of the McGraw-Hill Publishing Company, had contributed $50,000 toward a fund of $2,000,000 for the Engineering Societies Library. Mr. McGraw's contribution made the amount raised thus far toward the library fund $200,000.

Dr. Harvey N. Davis, president of the Stevens Institute of Technology, was the principal speaker at the dinner. He reported on the results of research in the properties of steam.

H. Hobart Porter, the new chairman of the foundation, who presided at the meeting and dinner, was inducted into office by Lewis B. Stilwell, retiring chairman.

Activities of the Federal Power Commission

Red Wing (Minn.), Eagle Pass (Tex.), Rock Island (Wash.) and Chattahoochee (Ga.) Projects Await Adjudication from National Capital

APPLICATION is reported from the city of Red Wing, Minn., to the Federal Power Commission for a preliminary permit covering the erection of a power house to be a part of the United States government dam now under construction in the Mississippi River near Hastings, Minn., 20 miles from Red Wing. The municipality proposes to install 5,300 hp.

The diversion of 1,250 sec.-ft. from the Rio Grande River, 40 miles above Eagle Pass, Tex., and its return to the stream 30 miles lower down, in no way affects the interests of navigation, and the project of Maverick County Improvement District No. 1 therefore does not come within the jurisdiction of the commission. This is understood to be the opinion of the district engineer who recently reported on the project. The irrigation district plans to use the water to develop 7,000 hp. Formal objection to the development has, however, been lodged with the commission by the American members of the International Water Commission. This commission is engaged in a study of the Rio Grande and Colorado Rivers in an effort to work out an agreement between Mexico and the United States for the allocation of waters. Any additional diversions on the American side at this time would complicate an already intricate situation, it is contended.

A favorable report from the field has been received by the Federal Power Commission on the Rock Island project of the Washington Electric Company on the Columbia River. The granting of a preliminary permit for this large proposed development is recommended on condition that adequate provision be made for the passage of fish over the dam. It is believed that no great difficulties will be encountered in providing satisfactory fish ladders over the Rock Island dam, which will be lower than those planned in any of the other Columbia River projects.

The plan proposed by J. Smith Lanier for the development of 40,000 hp. on the Chattahoochee River at West Point, Ga., is preferred in a report to the Chief of Engineers to that of the Columbus Electric Power Company. The Lanier plan makes provision for flood control.

The Arizona Power Company has applied for a license covering 134 miles of constructed transmission lines in Yarapai County, Ariz. The line is interconnected with the system of the Central Arizona Light & Power Company.

The Beaver Creek ranch at Prescott, Ariz., has applied for a license covering a 75-hp. development on Beaver Creek in Yarapai County, Ariz., the power to be used for domestic purposes.

"Electrical World's" London Letter

British Engineers Find Cause for Surprise at N.E.L.A. "Jubilee of Light" Celebrations—Progress with National Interconnection—Tackling the Smoke Problem

By Bernard C. Holding
Editor of *The Electrician*

London, May 18, 1929.

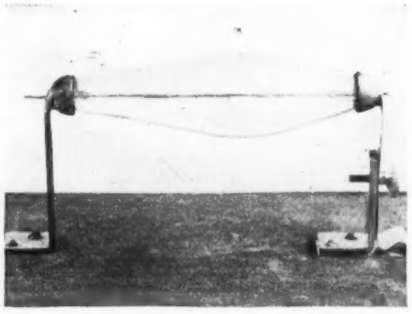
CONSIDERABLE surprise has been aroused in this country by the news that the forthcoming N.E.L.A. convention is to celebrate Edison's invention of the first incandescent electric lamp. British engineers claim—and there is an abundance of supporting evidence—that the real inventor of the incandescent lamp was the late Sir Joseph Swan, who in December, 1878, gave a public exhibition of his first practical lamp. On October 31 last we celebrated the centenary of Swan's birth, and the Institution of Electrical Engineers on December 20 last celebrated the jubilee of Swan's invention and held a special meeting, when James Swinburne, F.R.S., delivered a commemorative address in which Swan's priority over Edison in this field was clearly demonstrated. It is felt over here that subtraction of the incandescent lamp from the long list of Edison's inventions can make no real difference to his well-deserved reputation as an inventor.

Since I last wrote the annual report of the Electricity Commissioners has been published. The returns show a remarkable recovery from the adverse effects of the coal strike, with a total output of nearly ten billion kliowatthours, an increase of 18.7 per cent over the previous year's figures. It is interesting to note, too, that this increase was obtained with the relatively small increase of 5.4 per cent in fuel consumed. We have become so used to hearing this country described as "backward" in electricity supply that it comes as a shock to find that in six years we have practically doubled the output of our generating stations and have increased by more than 50 per cent the amount of electricity produced per ton of fuel consumed. Prospects for further expansion are, of course, very great, and vigorous steps are being taken to make good the leeway caused by the restrictive legislation of the past.

Apart from the interconnection schemes, in the development of which they are working with the Central Electricity Board, the Electricity Commissioners are seeking to promote the development of suitable loads for the new plants. To this end they have set up two committees, one to consider steps for making hire and hire-purchase facilities practically available for all prospective consumers the other to make definite proposals to secure a greater uniformity in tariffs.

The Electricity Commission's electricity scheme of the Mid-East England area, which has now been adopted by the Central Board, affects an area of about 7,500 square miles. As there is virtually no plant of non-standard frequency in the area, the capital expenditure on this scheme will be quite low. Of the £4,616,750 to be spent, £2,907,156 represents expenditure on transmission lines and transformer stations, while the balance will be spent by owners of stations on plant extensions and so forth.

The smoke problem, which I believe is also engaging the interest of United States central-station engineers, is very much to the fore following public protests against the erection of the proposed new station of the London Power Company at Battersea on the River Thames, a district mainly residential which views with marked disfavor the prospect of a daily emission of sulphurous gases in unprecedented quantities. As the station will operate mainly for base-load purposes, it is difficult not to sympathize with those who are so ardently defending the amenities of one of the finest parts of London and are pressing for the adoption of a site outside the metropolis. Questions have been asked in the House of Commons and the matter has also been discussed in the House of Lords, so far without definite results. An undertaking has been given that the latest scientific methods of coal combustion, and means to prevent so far as is possible the emission of corrosive fumes, will be employed, and the government chemist is watching some laboratory experiments which are said to promise improvement. In spite of all this, most chemists regard the problem as one of almost insuperable difficulty, though it is recognized that every effort should be made to evolve methods which will permit the electrical industry to maintain its proud contention that "electricity is clean."



Original Swan Incandescent Lamp

Considerable developments are proceeding in the lighting field. Further lamp price reductions have coincided with a reduction in the number of types of lamp, and "pearl" and "opal" lamps are being specially pushed in conjunction with the slogan "Glareless light preserves the sight." "Architectural lighting," by which is meant lighting that is an integral part of the building or room in which it is used, is already arousing great interest and bids fair to revolutionize existing conceptions of decorative lighting.

The voluntary movement for the registration of electrical installation contractors by an independent examining authority finds itself, at the end of five years, in an increasingly influential position, with a roll of nearly 1,300 contractors in all parts of the country who have given satisfactory proof of their ability to provide customers with a sound and reliable electrical installation. While the National Register has found it impracticable to enforce a definite wiring code in a country which has no officially enforced regulations, it is now issuing to registered contractors a list of methods which will in future be deemed to provide cause for the expulsion of a contractor from the register. Furthermore, it is pointed out that registered contractors are expected to follow generally the basic principles laid down in the wiring regulations of the Institution of Electrical Engineers.

Of particular interest to American electrical engineers is the recent departure for a tour of the United States and Canada of Sir Andrew Duncan, the chairman of the Central Electricity Board, who is accompanied by Archibald Page, the board's chief engineer.

Monthly Demand Charges at Indianapolis Argued

Increased power costs would result were a change made from a yearly to a monthly basis of billing demand charges as asked by fourteen large Indianapolis consumers, according to testimony of representatives of the Indianapolis Power & Light Company at a hearing before the Indiana Public Service Commission. Large power users take the demand rate basis in order to get lower rates, and these consumers are entitled to the lesser cost, Joseph C. Stiphers, manager of the power company's traffic and rate department, told the commission. He denied that the Indianapolis Power & Light Company had placed consumers on the demand charge basis because there is no competition in the Indianapolis electric power field.

The witness stated that revenue from demand charge consumers had increased about $250,000 since the merger of the Indianapolis Light & Heat Company and the Merchants' Heat & Light Company and asserted that the increase resulted from increased operation of consumers and correcting of demand meter readings, though the latter cause amounted to very little.

T. W. Ayton, superintendent of the company's meter department, said that monthly readings of the peak-demand charts would cost the company about $10,748 a year. Representatives of the power users testified that their demand charges had been increased largely. No decision was given.

Briefer News

MALONE (N. Y.) COMPANY READY TO BUILD HYDRO PLANT ON ST. REGIS.—The Malone (N. Y.) Light & Power Company is preparing plans for the development of its power site on the St. Regis River at Hogansburg, where it will begin this summer to build a dam and power house to develop approximately 1,500 hp.

ROCHESTER, N. Y., GETS IMPROVED LIGHTING SYSTEM.—Concrete standards mounted with 400-cp. lamps will line seven miles of Lake Avenue from the center of Rochester, N. Y., to Lake Ontario by June 15, when the Rochester Gas & Electric Corporation completes an installation now under way. This is part of a recently launched better lighting program.

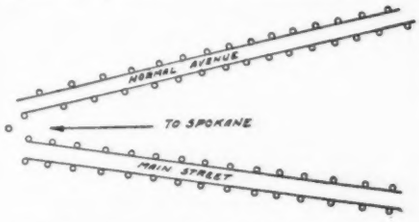
APPLICATION FOR 80,000-HP. DEVELOPMENT ON SALMON RIVER, ORE.—L. A. Kolberg of Portland, Ore., has filed application with the state engineer covering a permit to store 150,000 acre-feet of water from Salmon River and Zigzag Creek and tributaries thereof and to appropriate 2,500 sec.-ft. of such stored water for the development of 80,000 hp.

HAMILTON (OHIO) CITY ELECTRIC PLANT ORDERS THIRD UNIT.—Award of contracts for the third unit of the municipal electric plant has been authorized by the City Council of Hamilton, Ohio. The contracts involve an expenditure of $227,000. Work on this 7,500-kw. unit will be started within the next month, and it is expected to be in operation before November.

INDIANAPOLIS HAS A PUBLIC UTILITIES DISTRICT.—Commissions of appointment as trustees of the public utilities district of Indianapolis, which was created for that city by the recent Legislature and which will have charge of any utilities acquired by municipal ownership, have been presented to five prominent citizens by the Mayor. Under the law the utilities district will have control of all city-owned utilities, of which there are none at present, the idea back of the formation being the acquirement of the gas company. In the future, if it is deemed necessary by the city to set up or acquire utilities, the district would, under the law, have charge.

SALT RIVER VALLEY ELECTRIFICATION.—At a cost of $1,200,000 the Salt River Valley electrification system in Arizona is nearing completion, bringing electricity to all the 7,000 farms in the project, of which 50 per cent have already subscribed for the service. One large unit is operating and power was to be ready for farms and ranches of the entire Salt River project by the first of June. Completion of electrification will require more than 400 miles of poles and several thousand miles of wire. All the 8,000 poles are steel except in locations where there is a possibility that the line may have to be moved, in which case wooden poles are used. The installation of the nine transformer distribution stations necessary in various parts of the valley has begun. Power was turned on in the Scottsdale area, one of the largest units in the program, on March 25.

CHENEY (WASH.) STREET-LIGHTING SYSTEM FORMS AIRWAY MARKER.—A new street-lighting system has been installed on two converging streets in Cheney, Wash., so as to form an arrowhead of light pointing in the direction of Spokane. Aviators, when flying at night from the West Coast to Spokane, are able to pick up the lights of Cheney and, by following the direction of the guiding arrow, find it a simple matter to locate their destination at the landing field at Spokane. The installation, designed and manufactured by the Westinghouse company, was donated to the town by Mayor C. D. Martin. It consists of 62 ornamental cast-iron standards of the "Arcadian" design with "Sol-Lux" luminaires equipped with "Bi-Lux" refractors and 4,000-lumen lamps.



PARIS HIGH-TENSION CONFERENCE OPENS NEXT WEEK.—The fifth International Conference on Large High-Tension Systems will open in Paris on June 6, as previously noted, and continue through June 15. Among the papers to be presented American engineers contribute two—Dr. C. O. Mailloux a second report on the rational utilization of fuels and H. W. Young, president Delta-Star Electric Company, Chicago, and Alfred Alsaker, chief engineer of that company, a paper on high-tension outdoor substation design illustrated by lantern slides and motion pictures.

ONTARIO HYDRO MAY BUY FOSHAY PLANTS IN THAT PROVINCE.—An armistice has been declared in the power war lately waged in Bruce County, Ontario, between the Ontario Hydro-Electric Power Commission and the W. B. Foshay interests of Minneapolis. In a conference with Premier Ferguson on May 18 Mr. Foshay intimated that he was willing to enter into negotiations with the Hydro for the purchase by the latter of his power properties and contracts in western Ontario. Mr. Foshay subsequently conferred with the Hydro officials. While it was stated that no purchasing or other negotiations were conducted at this conference, it is understood that the meeting was in the nature of a preliminary discussion.

POWER BIDS SOUGHT ON NEW YORK'S NEW SUBWAY.—Bids on a ten-year contract to supply electric power and light for the entire new subway system of New York City, which is to be ready in 1931, will be opened on June 28. In preparing specifications the city's board of transportation analyzed the possibility of constructing a city-owned power plant and found that it would cost from $30,000,000 to $40,000,000.

PROPOSED RED WING (MINN.) HYDRO DEVELOPMENT OPPOSED BY ARMY ENGINEER.—An application by the city of Red Wing, Minn., for permission to build a power plant at the United States dam on the Mississippi, near Hastings, is opposed by Major Robert C. Williams, U.S.A. district engineer in charge of that area, who insists that such a development would create a sewage settlement basin above the dam which in ten years would be a nuisance and a menace to health and also that the cost of the project renders it impracticable.

UTAH POWER & LIGHT INCREASES CAPACITY OF JORDAN STEAM PLANT.—Construction work has been commenced by the Utah Power & Light Company on an addition to its Jordan steam-electric generating station in Salt Lake City. The installation of two additional boilers with a heating surface of 18,000 sq.ft. each will increase the capacity of the plant from 20,000 kw. to 41,000 kw. The work, which will involve an expenditure of approximately $750,000, is expected to be completed early in the fall.

WEST MEXICO'S GREAT HYDRO RESOURCES.—Development of vast hydroelectric power resources in the west coast region of Mexico should receive the attention of American financial interests, according to H. B. Titcomb, president of the Southern Pacific Railroad of Mexico, with headquarters at Guadalajara. He declares that rivers and smaller streams which flow down from the Sierra Madres and empty into the Pacific Ocean, all the way from Guaymas to Tepic, afford ideal sites for water-power plants and that they also carry an abundance of water for irrigating great areas of land, several new irrigation projects being under way.

EIGHTY-THREE UTILITIES JOIN IN SAFETY CONTESTS.—The recent establishment of a safety section of the Oklahoma Utilities Association is in line with increased efforts of public utility companies throughout the United States to reduce accidents. Eighty-three electric light and power and gas companies, each having a thousand or more employees, have entered the 1929 safety contests, which will be conducted by the National Safety Council. These contests, which began January 1 and will

continue until June 30, are being held for the purpose of enlisting the spirit of competition in the effort to reduce accidents. Trophies will be presented to the winners next fall.

ELECTRIC BOAT SERVICE PROPOSED FOR LONDON.—A proposal to establish a fleet of electric passenger vessels to run at short intervals between Greenwich and Richmond, or other London suburbs on the Thames, has been brought forward by Captain W. P. Durtnall, who ten years ago unsuccessfully advanced a similar scheme. He is endeavoring to form a company to build a fleet of 40 double-decked vessels, of cellular construction, twin-propeller type and very shallow draft. They would carry 300 passengers each and be virtually unsinkable, Captain Durtnall holds.

POWER FROM BACK RIVER AT MONTREAL TO BE AVAILABLE THIS YEAR.—Power from the Montreal Island Power Company's hydro-electric development on the Back River, on the northern outskirts of Montreal, is expected to be available about November 1, according to engineers of the Power Corporation of Canada, which is constructing the plant. Three of the large generators are ready for installation. The initial equipment will be six units of 12,000 hp. capacity each, while the ultimate installation will be ten units of that rating.

PROGRESS ON CARPENTER DAM ON OUACHITA RIVER.—Six hundred men are now at work building the new dam of the Arkansas Power & Light Company on the Ouachita River, south of Hot Springs, which was referred to in the ELECTRICAL WORLD for February 2 (page 265). It will be known as the Carpenter Dam in honor of Captain F. J. Carpenter of Arkadelphia, who many years ago saw the possibilities of water power on the Ouachita River and who picked the present site as a favorable one. The plant will cost more than $6,000,000 and have a rating of 53,333 hp.

GEORGIA POWER COMPANY'S STEAM PLANT TO BE NAMED FOR H. M. ATKINSON.—The 100,000-hp. steam plant which will be constructed by the Georgia Power Company on the Chattahoochee River three-quarters of a mile south of the Marietta Road bridge will be named the "Atkinson steam plant," to honor Henry M. Atkinson, for many years chairman of the company's board of directors. Preliminary construction work on the first unit of the plant, which will be one of the largest in the entire South when completed, has been started.

INDIANA COMMISSION'S RURAL SERVICE POLICY.—John W. McCardle, now again the chairman of the Indiana Public Service Commission, has announced that the rural service policy pursued under his former administration will be resumed or continued. This policy, under which farmers are encouraged to build pole lines and then give them to the central-station companies, is said to be likely to cause disagreement between the power companies and the farmers. In many sections the latter maintain that the companies should build the lines, but the companies say the use of electricity on Indiana farms has not progressed to the point where it will pay them to do so. The farmers object in addition because when the lines they have built are turned over to the companies they represent a capital investment that is charged against earnings.

Coming Meetings

[A complete directory of electrical associations, with their secretaries, is published in the first issue of every volume. For latest list see issue for January 5, page 80.]

National Electric Light Association—Atlantic City, N. J., June 3-7. A. J. Marshall, 420 Lexington Ave., New York.

Artistic Lighting Equipment Association—Hotel Chelsea, Atlantic City, June 5-7. G. P. Rogers, 420 Lexington Ave., New York.

National Electrical Wholesalers' Association—Pacific Division Del Monte, Calif., June 13-15. E. Donald Tolles, 165 Boadway, New York.

North Central Electric Association—Breezy Point, Pequot, Minn., June 16-18. J. W. Lapham, 803 Plymouth Bldg., Minneapolis.

Association of Iron and Steel Electrical Engineers—Pittsburgh, June 17-21. J. F. Kelly, 1007 Empire Bldg., Pittsburgh.

Canadian Electrical Association — Algonquin Hotel, St. Andrew's by the Sea, N. B., June 19-21. H. M. Lyster, 712 Power Bldg., Montreal.

Pacific Coast Electrical Association—Del Monte, Calif., June 19-22. S. H. Taylor, 447 Sutter St., San Francisco.

Society for the Promotion of Engineering Education—Ohio State University, Columbus, June 19-22. F. L. Bishop, University of Pittsburgh, Pittsburgh.

Wisconsin Utilities Association — Accounting Section, Sheboygan, June 20-21; Electric Section, Wausau, July 18-19. J. N. Cadby, 432 Broadway, Milwaukee.

Empire State Gas and Electric Association—Accident Prevention Section, Watertown, N. Y., June 20-21; Commercial Section, Niagara Falls, N. Y., June 27-28. C. H. B. Chapin, Grand Central Terminal, New York.

American Institute of Electrical Engineers—Swampscott, Mass., June 24-28. F. L. Hutchinson, 33 West 39th St., New York.

American Society for Testing Materials—Chalfonte-Haddon Hall, Atlantic City, June 24-28. C. L. Warwick, 1315 Spruce St., Philadelphia.

Northwest Electric Light and Power Association—Seattle, June 26-29. B. Snow, 1206 Spalding Bldg., Portland, Ore.

Michigan Section, N.E.L.A.—Mackinac Island, July 1-3. Herbert Silvester, Edison Bldg., Ann Arbor, Mich.

American Society of Mechanical Engineers—Salt Lake City, July 1-4. C. W. Rice, 29 West 39th St., New York.

Camp Co-operation IX — Association Island, Henderson Harbor, N. Y., Aug. 2-6. Society for Electrical Development, 600 Graybar Bldg., 420 Lexington Ave., New York.

International Association of Electrical Inspectors, Western Section — Detroit, Aug. 26-28. W. S. Boyd, 175 W. Jackson Blvd., Chicago; International convention, Vancouver, B. C., Canada, Sept. 9-11. F. D. Weber, P.O. box 745, Portland, Ore.

International Association of Municipal Electricians—Boston, Aug. 27-30. H. N. Lang, Box 1864, Orlanda, Fla.

National Association of Railroad and Utilities Commissioners—Glacier National Park, Mont., Aug. 27-30. J. B. Walker, 270 Madison Ave., New York.

SANTEE RIVER, S. C., TO BE STUDIED.—A study of the Santee River system and its possibilities as to water power has been ordered by the Charleston (S. C.) district United States Army engineers' office. A preliminary report on the Santee River was completed in February and forwarded to the Chief of Engineers. The more intensive survey is expected to begin this summer. Survey and field parties are now working on a similar report on the Pee Dee River and its tributaries.

IOWA RAILWAY & LIGHT TO EXPAND.—The Jefferson (Iowa) power plant of the Iowa Railway & Light Corporation will be the principal distributing center for the west end of the utility's lines when remodeling and expansion announced by D. D. Roche, division manager, are completed. A new oil-burning Diesel engine will be operated with the present steam plant and a transmission line will be built between Farlin and Scranton, providing a two-way network for all towns in the section.

RURAL ELECTRIFICATION GOES AHEAD IN IDAHO.—A survey issued recently by the Idaho Committee on the Relation of Electricity to Agriculture shows that in the past four years the number of farms receiving electric service has increased from 7,006 to 11,035 out of a total of 40,000 farms. In 1924 the energy consumption per rural customer on the Idaho Power Company's lines was 114 kw.-hr. per month. For 1928 the average was 146 kw.-hr. These figures do not include any of the small irrigation pumping loads. Hobart Beresford of the department of agricultural engineering, University of Idaho, Moscow, is the secretary and project director.

BALTIMORE INDUSTRIAL FIRMS ASK LOWER RATES.—Hearings began on Monday of this week before the Maryland Public Service Commission on a petition filed by the Industrial Power Consumers' Association asking for lower industrial power rates. It asserts that the industrial power rates in Baltimore were increased during the war for the purpose of protecting other classes of consumers from increases which otherwise would have been necessary, and that although all other electric rates have since been reduced below the pre-war level, the industrial rates, which affect 150 or more large consumers, are still subject to a considerable portion of the war-time increase.

TWO LEWIS RIVER SITES ONLY NOW SOUGHT BY INLAND COMPANY.—Modification of the application of the Inland Power & Light Company, Portland, Ore., for a preliminary federal permit to develop power on the Lewis River, Wash., has caused the withdrawal of some of the protests filed

against it. The company formerly had applied for a preliminary permit including the Ariel, Yale, Swift Creek and Muddy Creek sites. At a recent hearing it asked that its original application be modified to include only the Ariel and Yale sites, which would permit a slightly higher dam at the Yale site than was originally contemplated.

MANITOWOC, WIS., ENLARGING MUNICIPAL PLANT.—The Public Utilities Commission of Manitowoc, Wis., has awarded contracts for a 5,000-kw. turbogenerator, boilers and other equipment. This is the initial step to enlarge the municipal power plant by the use of an appropriation of $410,000 made for this purpose. Further purchases of equipment will be made soon and construction work on a new building will start as soon as contract is awarded.

INDUSTRIAL HEATING SCHOOL CLOSES.—After ten days of classroom sessions and inspection trips in both Cleveland and Detroit, the 1929 Industrial Heating School closed in the latter city on May 24 with a record attendance of power engineers. The school was held under the auspices of the industrial heating committee, Commercial National Section, N.E.L.A. with the cooperation of the N.E.M.A. Competent lecturers from the manufacturing and central-station fields discussed the subject of electric heat in industry in its broader aspects as well as from the standpoint of the more specific technical problems involved.

RATE REVISION FOR SOUTH GEORGIA COMPANIES SOUGHT.—The Columbus Electric & Power Company, the South Georgia Power Company of Albany and the Savannah Electric & Power Company, all Stone & Webster utilities, have been cited by the Georgia Public Service Commission to appear before that body on June 25 to show cause why their domestic lighting and power rates should not be revised. The Columbus company sells energy wholesale to many towns in the nearby territory, but only the city of Columbus is affected by the order. Towns served by the Albany company which are included in the order are Albany, Cordele, Sylvester, Tifton, Camilla, Pelham and Ashburn. The Savannah company serves only the city of Savannah.

COPIOUS RAINFALL CAUSES TEMPORARY SHUTDOWN OF AMSTERDAM (N. Y.) STEAM STATION.—Rainfall records compiled by the power control department of the New York Power & Light Corporation show that the precipitation for April was 85 per cent higher than normal. The average for this year was 6.75 in. as against a normal of 3.66 in. As a result the storage reservoirs were filled about May 1 as against June 1 in normal years. The storage reservoirs are on the Hudson River, Mohawk River and Hoosick River watersheds. They have a total capacity of 12,142,000,000 cu.ft. of water, representing about 60,000,000 kw.-hr. in generation at the power stations. Because of the extraordinary rainfall, the company's main steam station, of 60,000 kw. rating, at Amsterdam has been shut down since February.

PUBLIC UTILITIES ADVERTISING ASSOCIATION'S NEW OFFICERS.—At the recent convention of the Public Utilities Advertising Association, in Chicago, Louis D. Gibbs of the Edison Electric Illuminating Company of Boston was elected president to succeed J. C. Barnes of the New Orleans Public Service Corporation. Dana H. Howard of the Commonwealth Edison Company and Irving M. Tuteur of the McJunkin Advertising Agency of Chicago were elceted vice-presidents, R. E. Haas of the Columbia Gas & Electric Company secretary, and Howard F. Weeks of the American Gas Association treasurer. Prominent utility men from different parts of the country addressed the convention on promotional and other advertising.

Commission Rulings

UTILITY COMPANIES CANNOT EXEMPT THEMSELVES FROM RESPONSIBILITY BY BLAMING DIVISION MANAGERS.—The Wisconsin Railroad Commission has disallowed the plea of the Dekorra Farmers' Mutual Telephone Company that the management of one of its divisions, and not the parent company, was responsible for unlawful extensions of service. The commission denied the independence of such divisions, saying as proof of their control by the company itself: "While such an arrangement may have been made for the convenience of the various branches of the company, the articles of incorporation do not indicate any such organization, and it appears from the testimony that the members of all divisions have been considered eligible to vote at the annual and special meetings of the stockholders of the company."

PAYMENT TO HOLDING COMPANY—INITIATION OF RATES—JURISDICTION BOUNDARIES.—Three well-established principles held by the Wisconsin Railroad Commission in rate adjudication were cited by it in granting increased rates to the St. Croix Valley Telephone Company. They follow: (1) Payment to a parent or holding company will be allowed as an operating expense of the subsidiary only where the charges for holding-company service are such as can be substantiated by evidence of cost to the holding company for rendering such service. (2) Where proposed rates will not result in more than a fair return to the utility, they should be allowed unless the structure of the schedule is such that it will result in unfair discrimination against a certain class or classes of subscribers. (3) Where a proposed application for a rate increase applies for service in a neighboring state as well as the state in which the commission is sitting, the approval of the commission will not apply to those rates which are beyond the boundaries of the state.

Recent Court Decisions

ASSUMPTION OF RISK PREDICATED, NOT ON EXERCISE OF DUE CARE, BUT ON KNOWLEDGE OF DANGER.—Albey vs. Monongahela-West Penn Public Service Company was a suit for damages because of injuries received by plaintiff when a ladder which he was using came into contact with an unguarded high-tension transmission line belonging to the company. Assumption of risk and contributory negligence were adduced by the company in its own defence. The Ohio Circuit Court of Appeals held that contributory negligence was an issue for the jury and that the question of assumption of risk was properly withdrawn from the jury since it has to do, not with the exercise of due care, but with whether the dangerous condition was known or plainly observable. The issue in this case, the court said, was not applicable to any established fact. (31 Fed. [2d] 85.)*

POWER COMPANY NOT REQUIRED TO INSULATE WIRES WHERE NO ONE COULD REASONABLY BE EXPECTED TO COME IN CONTACT WITH THEM.—An employee of a telephone company was electrocuted while helping to erect a pole line by contact with a 13,800-volt transmission line of the Kentucky Power Company. Suit was brought (Moran's Administratrix vs. Kentucky Power Company) to recover damages, but the Court of Appeals of Kentucky affirmed judgment for defendant on the grounds that a power company is not required to insulate its wires along the entire system, or parts of it where no one could reasonably be expected to come into contact with the wires, and that the evidence showed the accident to have been due to an insufficiency of men engaged in setting the telephone line. Casual mention by a representative of the telephone company to a power-company official that the former would begin work on the line on a certain date was not a sufficient notification. (14 S.W. [2d] 1087.)

CONSTRUCTING, NOT OPERATING, COMPANY LIABLE FOR DAMAGES BECAUSE OF VIBRATION OF PLANT.—Byrne vs. Monongahela-West Penn Public Service Company was a suit to recover the value of a dwelling alleged to have been damaged by the vibration caused by the operation of the company's generating plant, situated 450 ft. away. The principal damage to the house as a dwelling was that the vibration made it uninhabitable, preventing sleep and repose. Other damages were of little consequence. The plant was originally owned and constructed by the Central Utilities Company. It was purchased by the defendant in September, 1923. The company admitted that the operation of the plant caused the vibration, due probably to the character of a substratum of earth which cannot be remedied. In reversing the judgment of the lower court in favor of the plaintiff, the West Virginia Supreme Court of Appeals held that since the damages to the property were permanent and not recurrent, the plaintiff's suit was properly against the corporation which erected the plant and operated it and thus caused the permanent damages. (146 S. E. 522.)

*The left-hand numbers refer to the volume and the right-hand numbers to the page of the National Reporter System.

News About Men of the Industry

H. M. Atkinson Honored by Georgia Power Company

Henry M. Atkinson, for more than 40 years a leader in the industrial progress of Georgia and at the present time chairman of the board of directors of the Georgia Power Company, Atlanta, was signally and deservedly honored by the company he has served for so many years when it was recently announced that the new 100,000-hp. steam-electric generating plant on the nearby Chattahoochee River to be built by the Georgia Power Company will be named the Atkinson steam plant. He has devoted his abilities and his fortune to public undertakings which contribute to the industrial, educational and civic progress of the community and particularly valuable have been his services in the field of electrical development. He was the leader of the enterprise which resulted in Atlanta's having its first electric lighting system in 1891. He was the first president of the Georgia Electric Light Company and was an important factor in the consolidation of the City Railways & Lighting Companies of Atlanta into the Georgia Railway & Electric Company. He also organized the Georgia Railway & Power Company, which subsequently leased the Georgia Railway & Electric Company. By way of comment the Atlanta *Journal* said:

"This monument of industrial enterprise will tell the future much concerning the man whose name it will bear, but much more will be told in the ever-living record of what he has done for Georgia's agricultural development and for the promotion of that which enriches a people's mind and heart. His years of free effort in behalf of better farms and his labors of love as president of the Atlanta Music Festival Association show at once the wide range of interests and the liberality of his public spirit."

B. C. Cobb has been named chairman of the board of directors and Thomas W. Martin president of the Commonwealth & Southern Corporation, recently organized. Mr. Cobb is chairman of the board of the Allied Power & Light Corporation and president of the Commonwealth Power Corporation and Mr. Martin is president of the Southeastern Power & Light Company.

Robert F. Burnett, general manager of the Peoples Gas & Electric Company, controlled by the Carlisle interests, has resigned, after being connected with the local company for eleven years, to become general manager of the South County Public Service Company, Westerly, R. I., and the Mystic Power Company, Mystic, Conn. The two companies supply many of the smaller cities in the two states in which they operate. Mr. Burnett became identified with the Oswego properties in 1915 as superintendent of the local company under the Tenney interests, and three years later succeeded Roy F. Whitney, who entered the New England field.

Drake V. Smith has been appointed manager of both the advertising and merchandising activities of the United Electric Light & Power Company, New York, to succeed Ralph Neumuller, who resigned to join the Westinghouse Lamp Company. He has been Mr. Neumuller's assistant for over seven years. Mr. Smith joined the United company in the summer of 1909.

A. B. West Named President of Nevada-California Utility

Arthur B. West, president of the Southern Sierras Power Company, Riverside, Cal., has been named president of the Nevada-California Electric Corporation to succeed Edwin S. Kassler, resigned. A lawyer by profession, Mr. West became identified with the utility business in a legal capacity as a junior member of the firm of Potter & West, counsel for the Nevada-California Power Company at Denver. Thereafter he became more and more closely identified with hydro-electric development on the Pacific Coast. Subsequently when the power company decided to enter the southern California field Mr. West was transferred to the operating end of the business, becoming vice-president and assistant to the president, who at that time was Delos A. Chappell. When Mr. Chappell died in 1916 Mr. West was made first vice-president and general manager, and early in 1923 he was named president and general manager.

Mr. West has held executive positions with companies affiliated with the Southern Sierras Power Company and in addition has been active in association work for many years, being a past-president of the Pacific Coast Electrical Association.

Mr. Kassler is resigning as president of the Nevada-California Electric Corporation, after occupying that office for ten years, to have more time to devote to his private affairs. He will retain his connection with the company as a director and member of the executive committee.

J. S. Moulton Appointed Executive Engineer

J. S. Moulton, recently appointed executive engineer of the Great Western Power Company, San Francisco, was graduated in mechanical engineering from Yale University in 1920. Following his graduation he entered the employ of the General Electric Company at Schenectady and went through its test course both there and in Pittsfield. At the conclusion of this course he spent a few months in the central-station section of the lighting division and then joined the staff of the San Joaquin Light & Power Corporation, Fresno, as assistant engineer in the operating department. Early in 1921 he was promoted to the executive division of that company as assistant to the executive engineer. He continued in that position until May, 1927, taking up in the meantime work as special engineer for the Great Western Power Company in connection with evaluation of the San Francisco distribution system, which the city proposed taking over. In this capacity Mr. Moulton testified at length before the California Railroad Commission concerning the results of the taking over of the San Francisco property and business of the company. In May, 1927, he was transferred from Fresno to San Francisco as a staff assistant to A. Emory Wishon, vice-president and general manager of both the Great Western Power Company and the San Joaquin Light & Power Corporation, and continued in that capacity until his recent appointment as executive engineer of the former company. His connection with the executive staff of the latter continues.

Louis C. Smith, a vice-president of the New York Power & Light Corporation and since the formation of that company in 1927 manager of its Mohawk division, with headquarters at Gloversville, has been appointed manager of the Schenectady division of the company. Early in his career he was identified with the United Gas Improvement Company and with the Omaha Gas Company and in 1912 he became affiliated with the New York properties as engineer of the Fulton County Gas & Electric Company. Subsequently he became president and general manager, and when that utility was consolidated with other companies in 1927 to form the New York Power & Light Corporation he became a vice-president and manager of the Mohawk division.

L. D. Gibbs President of Utilities Advertisers

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Louis D. Gibbs, assistant head of the public relations bureau, Edison Electric Illuminating Company of Boston, has been elected president of the Public Utilities Advertising Association, a department of the International Advertising Association. He has also been made president of the Advertising Club of Boston and is chairman of the publicity division of the Boston "On-to-Berlin" division of that organization. He will sail July 27 for Germany to attend the forthcoming international convention on advertising. Mr. Gibbs is a past-president of the New England division of the National Electric Light Association and is chairman of the advisory publicity council of the Society for Electrical Development. He has been engaged in advertising and public relations work with the Boston Edison Company for the past 23 years.

WILLIAM C. CLARKE has resigned as general manager of the South County Public Service Company and the Mystic Power Company, with headquarters at Westerly, R. I., effective June 1. Mr. Clarke has been in public utility service for the past 28 years and was formerly general manager of the Narragansett Pier Electric Light & Power Company, the Wickford Light & Water Company and the Seaview Railroad, all of Rhode Island. From 1916 to 1922 he was assistant to the general superintendent of the Narragansett Electric Lighting Company, Providence, and for the past seven years has managed the South County property, now a subsidiary of the New England Power Association. He plans an extended European trip in the near future.

B. S. ROBINSON, who has been connected with the editorial staff of the ELECTRICAL WORLD as assistant editor, has been appointed to the staff of Waterbury Cable Service, Inc. His experience includes eight years with the Pennsylvania Railroad in the telegraph and signal department, where he served as assistant supervisor of telegraph and signals, having charge of the installation, design and maintenance of telephone and signal circuits. While with the Philadelphia Electric Company, transmission and distribution department, he had charge of many investigations of cables and cable faults. Mr. Robinson is a graduate of the University of Pennsylvania and a member of the American Institute of Electrical Engineers.

A. E. BETTIS, vice-president of the Kansas City Power & Light Company, was the guest of honor at a dinner given at the Hotel President May 24, the occasion marking Mr. Bettis' twenty-fifth year of service in the company. A pioneer in the electrical utility business in Kansas City, Mr. Bettis for many years has been an active member of the National Electric Light Association, having served on the electrical apparatus committee for seven years. He is a director of the American Institute of Electrical Engineers, president of the Kansas City Electric Club and a member of the American Society of Mechanical Engineers.

E. B. CURDTS has resigned as superintendent of distribution of the North Carolina division of the Virginia Electric & Power Company to become an engineer in the production division of the Narragansett Electric Company, Providence, R. I.

H. W. YOUNG, president of the Delta-Star Electric Company, Chicago, Ill., sailed June 1 on the *Majestic* and will visit the Delta-Star connections in Europe. He will also present a paper on outdoor substations at the International High-Voltage Conference to be held in Paris June 6 to 15.

G. A. Burnham Heads American Brown Boveri

George A. Burnham, president of the Condit Electrical Manufacturing Corporation, has been named president of the American Brown Boveri Company, Inc., Camden, N. J., a newly formed subsidiary of the American Brown Boveri Electric Corporation, which was created for the purpose of placing all of the electrical and mechanical operations, exclusive of shipbuilding, under one management.

In addition to his duties as president of the Condit Electrical Corporation, Mr. Burnham has been assistant to the president of the American Brown Boveri Electric Corporation during the last nine months and general manager of the electrical-mechanical division, which activities are now included in the American Brown Boveri Company, Inc. A native of Essex, Mass., Mr. Burnham engaged in the construction and operation of power plants prior to attending college. Following graduation from Tufts College in 1908 he entered the employ of the Condit Electrical Manufacturing Company, which he has served in various capacities, being elected president of the Condit Electrical Manufacturing Corporation, successor to the Condit Electrical Manufacturing Company, in 1926. Mr. Burnham has been granted many inventions pertaining to the control and protection of electric circuits. He is actively interested in the American Institute of Electrical Engineers and the National Electrical Manufacturers' Association.

ADOLPH MEISTER, vice-president of the Garfield Manufacturing Company, sailed for Europe on May 30. He will make an extended tour of England, France, Germany and Switzerland and will investigate European developments in cold molding products and processes similar to those in which his company is interested.

JOHN F. PETERS, transmission engineer of the Westinghouse Electric & Manufacturing Company, received a Longstreth medal for the invention of the "klydonograph." Since 1918 Mr. Peters has spent all of his time on consulting work and special problems. In 1925 he was appointed to his present position of consulting engineer on high-voltage phenomena and transformer development for the entire Westinghouse organization. At the present time he has to his credit more than thirty patented inventions.

Obituary

JOHN G. SCHUSTER, 49 years old, president of the Schuster Electric Company, Cincinnati, electrical contractors, died May 15 following an operation. Mr. Schuster was a charter member of the Cincinnati Electric Club.

WILLIAM ZENTZ, executive manager of the Fredonia office of the Republic Light, Heat & Power Company, Dunkirk, N. Y., was drowned last week in Hollow Lake, Canada, while a member of a camping and fishing party. Mr. Zentz was 32 years of age.

DR. ING. ERASMUS KITTLER, for many years professor at the Technical High School of Darmstadt, died recently in that city at the age of 77. Dr. Kittler was one of the pioneers of the electrical industry in Germany, many of the early electricity stations in that country having been erected under his direction.

WRAY L. COLE, an official of the old Rochester Railway & Light Company, predecessor of the Rochester Gas & Electric Corporation, died May 17 in his seventy-first year. Mr. Cole was born in Adrian, Mich. He removed to Rochester when a small boy and up to twenty years ago was active in light and power interests in Rochester, holding many executive positions. Ten years ago he transferred his interests to California, where he lived until a year ago, when he returned to the East.

FRED B. PITNEY, advertising manager of the Brooklyn Edison Company since 1923, died May 20 at his home in Brooklyn of heart disease. Mr. Pitney had wide experience as a newspaper man. A native of Washington, he joined the staff of the New York *Tribune* at an early age and in 1912 became manager of its London office. He went to the *Evening Post* syndicate in 1919, where he remained until he joined the Brooklyn Edison Company six years ago.

Financial and Statistical News

SWEPT downward with the heavy marketwise selling movement which occurred early this week, many of the utility stocks lost much or all of their gains of the past two months, but recovered sharply after the movement.

——THE DECLINE, EASILY THE HEAVIEST THIS YEAR to date, was attributed to rumors of impending money stringency in connection with government financing—of a possible rise in the Federal Reserve rediscount rate—of high month-end call money. Weakness in the commodity markets was undoubtedly a factor also.

——INDICATING THE SEVERITY OF THE LIQUIDATION, the following stocks sold to the levels indicated in comparison with the recent high prices shown: American Power & Light, 103 from 120; General Gas & Electric, 79⅞ from 90; National Power & Light, 47⅛ from 61; Standard Gas & Electric, 86⅜ from 99⅞, and Electric Investors, 140 from 163.

——STOCKS OF THE ELECTRICAL MANUFACTURING CONCERNS also sold off sharply. Westinghouse sold to 144⅜ from a recent high of 168⅞ and General Electric sold to around 260 from a recent high of 295. Allis-Chalmers closed at 184, against 212.

U.G.I. Directors Vote Rights

Stockholders of the United Gas Improvement Company are to be given rights to convert their shares into preferred and common stock and are to receive dividends on the new stock equivalent to $5.62 per share on their present stock, the board of directors decided, according to a statement issued at the close of the meeting held May 24 by John E. Zimmermann, president of the company.

The recapitalization proposed consists of increasing the authorized capital stock from 6,000,000 shares of $50 par value to 40,000,000 no par shares, consisting of 35,000,000 common and 5,000,000 preferred shares.

Upon approval of this plan by the stockholders, they will be notified to exchange or convert their present shares into new preferred and common shares, on the basis of one-eighth of a share of new preferred and five shares of new common stock for each share of capital stock held.

It is also proposed to make a 10 per cent allotment of new no par common stock, to be offered for subscription at $20 a share to common stockholders of record October 31, 1929. Payment is to be made on or before December 3, 1929, and the stock sold will participate in dividends paid after January 1, 1930.

The preferred stock will be entitled to $100 a share upon liquidation and to cumulative dividends of $5 annually, and will be redeemable at $110 per share and accrued dividends. Dividends on the new common stock will begin at the rate of $1 annually, and the first quarterly payment of 25 cents will be made December 31, 1929. The first dividend on the preferred stock will be paid December 31, 1929, at the quarterly rate of $1.25.

The directors declared the regular quarterly dividend of $1.12½ a share on the present capital stock, payable September 30 to stock of record August 31.

The dividends of $5.62½, payable on five new common and one-eighth new preferred shares annually, compare with a present dividend basis of $4.50 annually on the $50 par shares.

Pennsylvania Power & Light Increases Capitalization

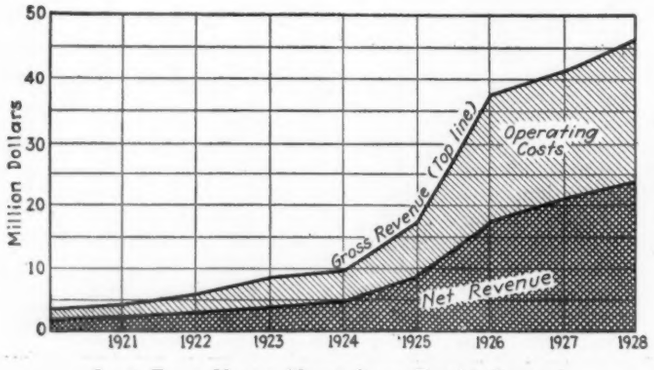
At the annual meeting of the stockholders of the Pennsylvania Power & Light Company, held recently in Allentown, increase of capital stock from $180,000,000 to $250,000,000, necessitated by expansion projects, was authorized.

ENGINEERS PUBLIC SERVICE INCREASES CAPITAL.—Stockholders of the Engineers Public Service Company at a meeting held May 20 voted to increase the authorized common stock from 3,000,000 to 4,000,000 shares and the preferred stock from 700,000 to 1,000,000 shares to enable the directors to issue new issues of either class promptly when financing seems advisable.

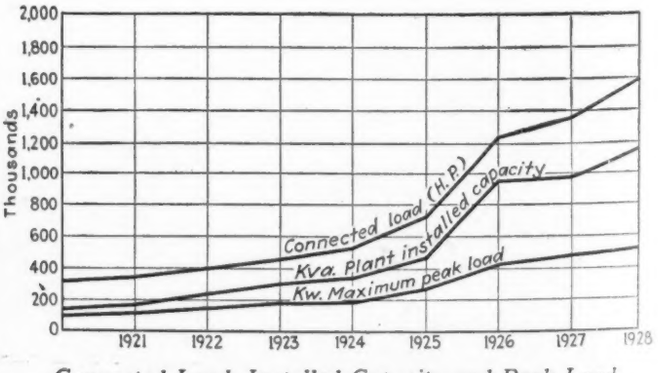
Southeastern Power & Light Installed Capacity up 18 per Cent

EXTENSION of its operations to take care of the rapid industrial development of the South is the keynote of the annual report of the Southeastern Power & Light Company for 1928. Power plant installed capacity was expanded 18.3 per cent. Electric service was extended to 282 additional communities. The connected load of the system was increased by 240,650 hp., and hydro generating plants having a capacity of 213,185 hp. were added to the system during the year. Furthermore, engineering investigations and surveys have been made for a series of hydro-electric projects on the Oconee, Flint, Etowah and Savannah Rivers. It is planned to proceed promptly with several of these developments.

From a financial standpoint, all this is reflected in increased earning capacity and a considerably strengthened cap-



Last Four Years Have Seen Rapid Growth in Southeastern's Revenue



Connected Load, Installed Capacity and Peak Load of Southeastern System

ital structure. During the year gross earnings expanded 11 per cent to $46,259,201 and net increased 14.5 per cent to $24,142,704. A glance at the company's balance sheet shows that for the first time the half billion mark is passed in assets, which total $530,383,871. An outstanding feature of this statement is the substantial provision being made for reserves. Reserves for retirements and renewals stand at $23,144,194, and for contingencies, including injuries and damages, almost $5,000,000 more. A surplus has been built up to the total of $21,650,357, which is almost half of the current annual gross earnings.

Earnings per share on the common stock of the company last year amounted to $3.42, against $2.92 in 1927 and $2.29 in 1926, disregarding the exercise of option warrants. A current price of around $90 is approximately 26 times last year's earnings, which is in line with the average for companies of this type.

The large increase in the company's connected load, already referred to, was the result of new industries located during the year, to the further use of electricity by industries already established, the acquisition of additional properties and the extension of service to new communities. At the end of the year the total connected load was 1,594,446 hp. The growth illustrates the rapid industrial progress being made in that part of the South served by the company. In all, 41 major industries, represented by sixty-eight industrial plants, were located in the territory served by subsidiaries during 1928. It is estimated that these plants will represent a capital investment of over $50,000,000 and will give employment to approximately 13,000 people with annual payrolls in excess of $11,000,000.

INTERNATIONAL COMBUSTION ENGINEERING INCREASES CAPITALIZATION.—Stockholders of the International Combustion Engineering Corporation at the annual meeting held recently voted to increase the authorized no par common stock to 1,150,000 shares from 1,100,000 shares. This increase in the authorized common is to make available stock for conversion of a similar amount of preferred stock which was offered to stockholders of record April 26, on the basis of one share of $100 to every twenty shares of common or preferred held.

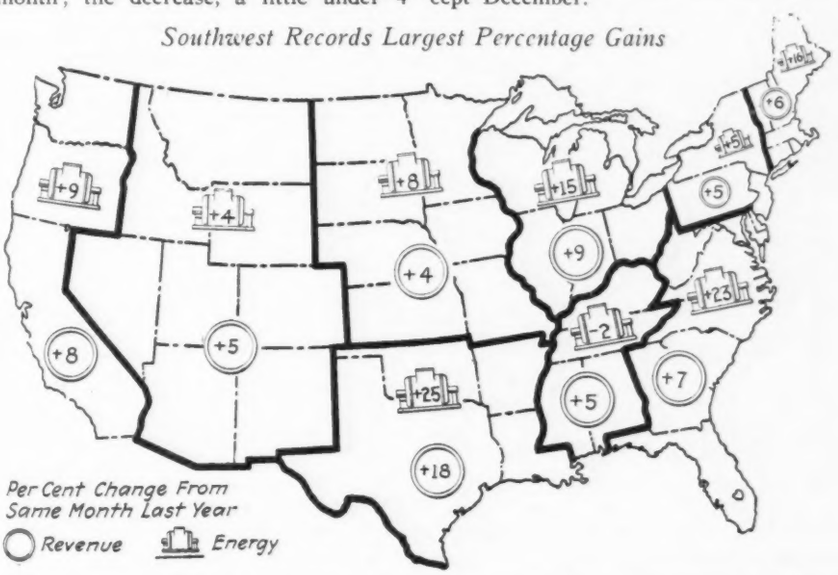
March Revenue for Light and Power $168,400,000

MARCH operations in the light and power industry indicate an increase of 7.1 per cent in revenue compared with the same month in 1928, according to monthly returns received by the ELECTRICAL WORLD, rising to a total of $168,400,000, while the corresponding operating expenses amounted to $68,600,000—5.7 per cent greater than they were a year ago. As is usual at this season of the year, the earnings were smaller than in the preceding month; the decrease, a little under 4 per cent, was virtually normal. The changes for four months are summarized in Table I. Meanwhile the energy output was materially greater than in February, broke all previous records except that of January, 1929, and passed that of March, 1928, by 839,614,000 kw.-hr., or 12.4 per cent, rising to 7,607,236,000 kw.-hr.

Comparison of the year's increase in revenue with that in energy output seems to indicate an appreciable reduction in the average rate, which has been going on for many months.

It is also to be noted that the average daily revenue for March, $5,420,000, is but slightly below the estimated normal based on returns for the past five years ($5,547,000), very much in line with the condition in January and February, while the energy output continues somewhat above the computed normal, the daily average for the latter being 240,000,000 kw.-hr., against a corresponding actual output of 245,000,000. Here again the condition is very similar to that of the two preceding months. As the accompanying chart indicates, the energy output rose above the computed normal in May, 1928, and has continued above it in each subsequent month except December.

Southwest Records Largest Percentage Gains



A noteworthy improvement is evident in the water-power situation. Deficient stream flow brought the energy from that source to an unusually small fraction of the total output during the winter months. In January and February it constituted less than 34 per cent. The increase over the corresponding months of the previous year was negligible, and the entire growth of the industry had to be supplied from fuel, with correspondingly large changes in fuel consumption. (Tables II and III.) Thus in January the output from thermal plants was almost 25 per cent greater than it was a year before. The balance was restored in March, with hydro energy rising to 3,081,789,000 kw.-hr., or slightly over 40 per cent of the total. The ratio

Table I—Central-Station Financial Operations in the United States

Compared with Corresponding Month of Previous Year

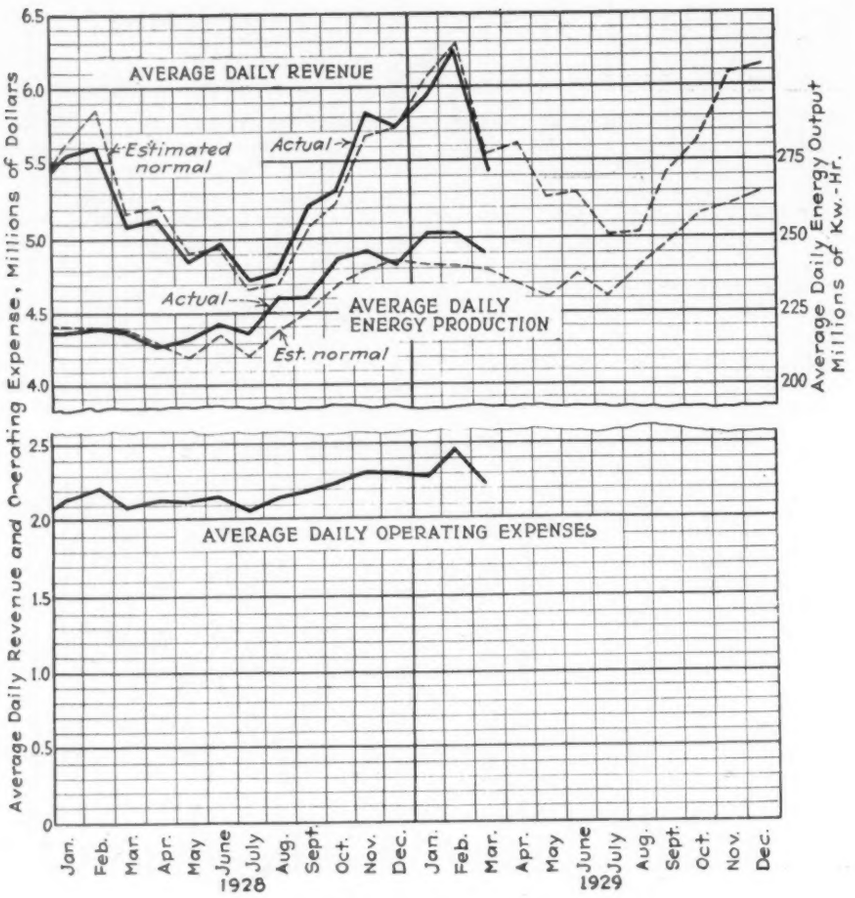
Month	Total Gross Revenue from Sale of Energy*			Total Operating and Maintenance Expense†		
	1928 Thousands	1927 Thousands	Per Cent Inc.	1928 Thousands	1927 Thousands	Per Cent Inc.
December	$177,600	$165,100	+ 7.6	$71,400	$67,900	+5.1
	1929	1928		1929	1928	
January	184,400	171,700	+ 7.4	71,900	66,700	+7.8
February	174,900	162,300	+ 7.6	68,100	64,200	+6.1
March	168,400	157,300	+ 7.1	68,600	64,700	+5.7

Table II—Central-Station Fuel Consumption in the United States‡

Compared with Corresponding Month of Previous Year

Month 1928	Coal		Oil		Gas	
	Short Tons	Per Cent Increase	Barrels	Per Cent Increase	Thousands Cubic Feet	Per Cent Increase
December	3,539,733	+ 6.0	814,151	+30.5	7,117,843	+48.0
1929						
January	3,796,778	+14.3	909,085	+62.0	7,923,161	+60.0
February	3,388,395	+ 8.5	830,969	+59.3	7,203,387	+47.0
March	3,280,150	+ 5.1	696,815	+19.2	7,805,260	+39.3

*Aggregate gross revenue from consumers and from other utilities for energy for resale, involving a certain amount of duplication.
†Do not include interest, taxes, depreciation or sinking fund, with some unavoidable exceptions. ‡As collected by U. S. Geological Survey.



March Daily Averages

Revenue, $5,420,000; Output, 245,000,000 Kw.-Hr.

between hydro and fuel energy was nearly the same as in March, 1928.

Regionally, the largest changes in output occurred in the West South Central and South Atlantic divisions, the gains over March, 1928, being 23.5 and 25 per cent respectively. The influence of the Conowingo plant is seen in the rise from 452,046,000 kw.-hr. of hydro energy in the South Atlantic states, for the same interval, to 670,286,000 kw.-hr. The increase of 217,880,000 kw.-hr. much exceeds that in any of the other divisions.

The proportionate revenue gains did not differ greatly in the several regions from the country-wide average, except in the Southwest, where rapid expansion continues and where the large increase in energy production is more closely paralleled than elsewhere by the growth of revenue. The reports indicate a rise in the latter of 17.9 per cent. Regional data are given in Table IV, and the percentage changes compared with the same month last year are indicated on the map.

Table III—Energy Output of Central Stations in the United States

Compared with Corresponding Month of Previous Year

Month 1928	Generated, Thousands of Kw.-Hr.*						Purchased for Resale	
	Total		Hydro		Fuel			
	Generated	Per Cent Inc.	Generated	Per Cent Inc.	Generated	Per Cent Inc.	Thous. Kw.-Hr.	Per Cent Inc.
December	7,505,377	+10.2	2,693,095	— 0.1	4,812,282	+17.0	1,348,000	+10.3
1929								
January	7,803,765	+15.2	2,625,408	+ 0.6	5,178,357	+24.5	1,260,000	0
February	7,050,368	+10.1	2,390,647	— 2.9	4,659,721	+18.2	1,155,000	— 4.0
March	7,607,236	+12.4	3,081,789	+12.6	4,525,447	+12.4	1,390,000	+ 9.0

Table IV—Regional Operations, Revenue and Energy Output in March, 1929

Compared with Corresponding Month of Previous Year

Region	Revenue		Energy Generated, Thousands of Kw.-Hr.*					
			Total		Hydro		Fuel	
	Thousands of Dollars	Per Cent Inc.	Generated	Per Cent Inc.	Generated	Per Cent Inc.	Generated	Per Cent Inc.
United States	168,400	+ 7.1	7,607,236	+12.4	3,081,789	+12.6	4,525,447	+12.4
New England	16,340	+ 6.5	508,901	+16.0	213,754	+14.8	295,147	+17.0
Middle Atlantic	43,800	+ 5.2	1,752,536	+ 4.9	583,098	+ 3.5	1,169,438	+ 5.7
East North Central	44,000	+ 8.7	1,949,115	+15.3	259,075	+21.5	1,690,040	+14.5
West North Central	12,700	+ 4.0	416,140	+ 8.3	129,896	— 3.5	286,244	+14.4
South Atlantic	19,250	+ 7.2	1,062,911	+23.5	670,286	+48.4	392,625	+ 0.4
East South Central	5,600	+ 5.2	284,865	— 2.5	218,936	— 3.4	65,929	+ 0.5
West South Central	8,310	+17.9	371,119	+25.0	8,435	+63.3	362,684	+24.3
Mountain	4,120	+ 5.0	306,725	+ 4.5	260,734	+ 1.2	45,991	+27.7
Pacific	14,280	+ 8.0	954,924	+ 9.0	737,575	+ 0.4	217,349	+53.0

*As collected by U. S. Geological Survey.

New Holding Company Links Three Big Systems

The Commonwealth & Southern Corporation has been formed by the Bonbright interests to acquire working control of three public utility systems the assets of which exceed $1,042,000,000. The authorized capital stock of the new holding company will consist of capital stock of 62,000,000 shares without nominal or par value, of which 2,000,000 shares will be preferred stock and 60,000,000 common stock.

The business of the corporation is to acquire and hold securities of companies engaged in managing or operating public utility companies and companies doing a general construction, engineering or contracting business with public utility and other companies. It will begin its existence with assets valued at more than $250,000,000 at present market levels and will own more than 40 per cent of the common stocks of the Commonwealth Power Corporation, the Southeastern Power & Light Company and the Penn-Ohio Edison Company.

Bonbright & Company will be the predominant interest in the new company, and the American Superpower Corporation, which the Bonbright interests control, will be the largest stockholder of Commonwealth & Southern.

The stocks will be acquired in large blocks as a result of arrangements made with the American Superpower Corporation and certain other large holders of the stocks of the three utility systems.

The names of the officers and directors of the Commonwealth & Southern Corporation follow: B. C. Cobb, chairman of the board; Thomas W. Martin, president.

Among the directors also will be C. E. Groesbeck, president of the Electric Bond & Share Company; George H. Howard, president of the United Corporation of Delaware; Alfred L. Loomis, chairman of the American Superpower Corporation and vice-president of Bonbright & Company, Inc.; Sidney Z. Mitchell, chairman of the Electric Bond & Share Company; Ray P. Stevens, president of the Penn-Ohio Edison Company and of the Allied Power & Light Corporation, and Landon K. Thorne, president of Bonbright & Co., Inc., and president of the American Superpower Corporation.

Business News and Market Conditions

Approve Reorganization of N.E.M.A. Divisions

Formal approval has been given by the board of governors of the National Electrical Manufacturers' Association to the reorganization of N.E.M.A. divisions each composed of a number of sections, or manufacturing industries, having related interests. This action, taken during the recent spring meeting of the association at Hot Springs, Va., is in accordance with the new constitution and by-laws and is designed more closely to co-ordinate section activities.

The divisions which have already been organized and are now formally approved are the appliance, insulating material, radio, refrigeration, transmission and primary distribution, utilization and control, wiring devices and wiring materials. Two of these, the radio and appliance divisions, are retained from the original organization structure, as is the group of executives termed the policies division, which considers the problems of the entire association. Contrasted with the latter the other divisions named may be termed product groups.

An industrial heating division and a lighting division have also been authorized but are not yet organized.

Refrigeration Industry to Collect Output Figures

For the first time in the history of the electric refrigeration industry statistics will be collected on manufacturers' production and dealers' sales.

This announcement was made by the refrigeration division of the National Electrical Manufacturers' Association following a meeting held at Hot Springs, Va., on May 22. Manufacturers' figures will be collected by the N.E.M.A. division from member companies, representing approximately 70 per cent of the industry's production, and will follow the official procedure of the association by which all statistics reported to headquarters through a system of double envelopes remain unidentified in the totals. This information will be compiled quarterly and will be made retroactive to the first of the year. It is also expected that data will be obtained from some manufacturers of larger sized commercial machines.

The questionnaire to manufacturers will contain headings covering, among others, complete data on units made by each company, listed in their respective sizes by ratings of cubic content, dairy coolers, ice cream cabinets and water coolers.

The N.E.M.A. refrigeration division has also announced plans for co-operation with the Department of Commerce in the collection of dealers' sales figures. Marshall T. Jones, chief of the electrical equipment division of the Bureau of Foreign and Domestic Commerce, who attended the meeting, will supervise this activity.

Through this co-operative effort it is expected that the electric refrigeration industry will be greatly aided in its market and territorial analyses since the dealers' questionnaire will show figures relative to population groups in towns and states. A comprehensive list of dealers in electric refrigeration in the United States is now being prepared.

Delinquent Electrical Accounts

Division	April 1928	April 1929	Per Cent Increase or Decrease	Four Months 1928	Four Months 1929	Per Cent Increase or Decrease
New York	282	285	+1	1,211	966	—20
Middle and Southern Atlantic	223	150	—32.7	760	591	—22.2
New England	121	207	+71	473	665	+40.6
Central	842	637	—24.3	3,532	2,571	—27.2
Total	1,468	1,279	—12.8	5,976	4,795	—19.7

TOTAL AMOUNTS REPORTED

	April 1928	April 1929	Per Cent Increase or Decrease	Four Months 1928	Four Months 1929	Per Cent Increase or Decrease
New York	$33,847	$63,928	+88.8	$170,854	$198,170	+15.9
Middle and Southern Atlantic	22,928	18,761	—18.1	95,538	81,518	—14.6
New England	14,854	22,656	+52.5	57,292	84,508	+47.5
Central	100,885	94,604	— 6.2	426,206	328,237	—23
Total	$172,514	$199,949	+15.9	$749,890	$692,433	— 7.7

AVERAGE AMOUNTS

	April 1928	April 1929	Four Months 1928	Four Months 1929
New York	$120	$224	$570	$802
Middle and Southern Atlantic	102	125	504	553
New England	122	109	483	499
Central	120	149	485	508

Contracts Average $360,000,000 per Month

For the fourth time this year the monthly value of engineering construction contracts exceeded $300,000,000, bringing the total to $1,438,000,000, which is 31 per cent more than for the four months of 1928, according to the *Engineering News-Record*. In millions of dollars the monthly figures have been as follows: January, 397; February, 365; March, 360; April, 316.

For the four months, gains in contract letting have been made in every class with the exception of sewers (down 14 per cent) and streets and roads, where the drop is 42 per cent.

Value of Contracts by Sections in the United States and Total for Canada, April, 1929

Thousands of Dollars (000 omitted)

	New England	Middle Atlantic	South	Middle West	West of Mississippi	Far West	United States April, 1929	U. S. Jan. 1 to Date	Canada April, 1929
Water-works	.....	$445	$176	$588	$948	$221	$2,378	$13,311	$200
Sewers	$155	1,866	296	2,986	969	798	7,070	24,741	150
Bridges	241	821	1,448	123	3,204	28	5,865	39,618	300
Excavations, etc.	260	34	20	511	151	100	1,076	14,729	.....
Streets and roads	3,567	12,133	7,388	9,018	7,773	5,247	45,126	105,178	3,286
Industrial buildings	3,947	9,543	10,570	6,949	3,583	1,424	36,016	191,272	4,865
Commercial buildings	13,904	83,057	4,374	29,765	10,885	17,009	158,994	759,175	3,540
Federal government	307	14,002	1,464	1,281	1,250	533	18,837	35,772	.....
Unclassified	646	16,475	16,307	384	4,403	2,632	40,847	254,355	4,036
April, 1929	23,027	138,376	42,043	51,605	33,166	27,992	316,209	.....	16,287
March, 1929	14,671	181,316	41,640	40,835	43,805	38,059	360,326	.....	19,641
April, 1928	17,018	114,380	24,780	73,765	41,813	30,972	302,728	.....	11,009
Year to date, 1929	77,554	602,356	123,022	249,565	229,316	156,328	.....	1,438,151	55,282
Year to date, 1928	65,568	417,611	89,284	249,354	162,253	109,453	.....	1,093,523	50,722

Market Conditions

POWER company buying has revived on the Pacific Coast and construction work is especially brisk, with the outlook particularly good for this time of year.

——JOBBERS REPORT EQUIPMENT BUSINESS DECIDEDLY MORE ACTIVE in the Puget Sound area.

——The MIDDLE WEST REPORTS ORDERS ABOUT NORMAL. Volume is small this week in the St. Louis area.

——VOLUME OF EQUIPMENT BUYING IN THE EASTERN DISTRICT is setting up some new records but a slight recession is regarded as not unlikely. Small motors and small power control apparatus are moving satisfactorily.

Business Continues Active in Eastern District

There is little change in the situation in the Eastern district. Inquiries are keeping good pace with commitments, which are rolling up some new high records for central station and industrial sales. While the immediate outlook is fair, a slight recession in buying, according to several manufacturers, is not far distant. Small volume sales continue to dominate the market. A feature of the week is the beginning of the extensive electrification program of the Philadelphia & Reading Railway; a contract has been let to the Bethlehem Steel Company for 4,000 tons of structural shapes for catenary supports and signal bridges between the Reading Terminal, Philadelphia, and Lansdale, and contracts will be awarded for feeder lines, substation equipment and other apparatus at an early date. The entire project will cost $20,000,000. A power company in Georgia has awarded a contract to a New York maker for a 60,000-kw. turbo-generator unit with accessories, and orders for boilers, coal pulverizing equipment and auxiliaries have been given to another New York manufacturer. A northern New York utility company has placed a commitment with a state producer for switchgear and regulators to cost $35,000. Business in the last noted line, as well as for other substation apparatus, is recording good progress.

A manufacturer of transformers in New Jersey reports a brisk trade, with inquiries maturing at an encouraging rate. There is a strong tone to the market for industrial motors and another New Jersey maker has secured contracts for several rolling mill units for plants in the Pittsburgh and Youngstown districts. The metal-working industries are absorbing a substantial quota of current commitments for motors, controls and kindred apparatus, while other prominent purchasers include chemical plants, cement mills, textile mills, ceramic plants and food product factories. A manufacturer of electric hoists states that business is quiet in this line, but there is a fair demand for electric cranes of 1 to 2 tons capacity.

Wire and cable are showing a better volume of transactions. Wiring devices are slow and price cutting has affected the stability of the market for fuses, receptacles and similar specialties. A leading jobber of electrical equipment in New York reports business for the first five months of the year showing a 10 per cent advance over the same period for 1928. There is a good demand for electric washing machines and heating irons. Street-lighting equipment is developing a better market and some early heavy commitments are in sight. A maker of airport lighting apparatus is recording sizable business for floodlights, beacons and standards. Construction projects are as follows:

The New York Edison Company, New York City, will make extensions in its substation on First Avenue to cost $85,000. The American Metal Company, Ltd., New York City, will build a copper refining plant at Copper Cliff, Ont., Canada, to cost $4,500,000. The New York Steam Corporation, New York City, plans a power house to cost $400,000. The National Casket Company, Long Island City, N. Y., plans an addition to its factory to cost $200,000. The American Copper Products Corporation, Elizabeth, N. J., will build a plant to cost $100,000. Princeton, N. J., plans a traffic lighting system. Trenton, N. J., plans the electrification of its waterworks pumping station to cost $50,000. The Pangborn Corporation, Hagerstown, Md., plans an addition to its sand-blast equipment manufacturing plant to cost $100,000. The Quartermaster Supply Officer, Washington, will receive bids until June 10 for two Diesel engine-generator units for Fort Huachuca, Ariz. (Circular 138). The Department of Commerce, Washington, will receive bids until June 13 for radio antenna towers in lots of 20 to 50 (Proposal 20940). The Purchase Section, Bureau of Standards, Washington, will receive bids until June 20 for one 750-kw. bleeder type turbo-generator set.

New England Orders Maintain Even Trend

The general trend in buying is steady in the New England district. Small orders dominate with small motors, general scheduled materials and new construction materials in greatest demand. Heavy equipment orders are reported pending and will be placed soon. Central-station equipment buying is steady with numerous inquiries for service transformers. The orders for small motors reached over $55,000 and orders totaling over $6,000 were closed. Small power control apparatus is selling well as compared with last year, one manufacturer reporting about a 20 per cent increase. Central-station supplies are moving actively and orders for insulators and outside control apparatus are being received in good volume. New construction is beginning to enliven more interest in buying, while poles, crossarms and hardware sales are gaining.

Power Company Buying Active on Pacific Coast

The past week on the Pacific Coast was particularly featured by power company business, such as two carloads of hardware each for the Great Western Power Company, the San Joaquin Light & Power Corporation and the Pacific Gas & Electric Company, an aggregate carload of miscellaneous paper and lead and varnished cambric cables for various companies and a carload of double galvanized strand. Construction work is especially brisk in the Napa Valley and the West side of the Sacramento districts, where bumper crops and light rainfall have caused an unprecedented demand for motors and transformers. The Pacific Gas & Electric Company is carrying on a May and June range campaign over the system with a monthly bogey of 500 ranges and 175 water heaters. The Westinghouse company reports a $40,000 order for a Tacoma, Wash., smelting company for three units of a synchronous motor-generator set and auxiliaries and $15,000 worth of subway transformers for the city of Los Angeles. The prospective industrial and construction business includes a tank and oil refining plant for Wilmington, near Los Angeles; a glass factory for Long Beach, a $1,000,000 tire plant addition for Los Angeles, a 10-mile telephone system for a lumber company and $2,500 worth of park cable for another in the Eureka district and $3,000,000 worth of machinery and equipment for the Ajo, Arizona mine. School construction is particularly prominent, including such items as a projected college for Santa Barbara, a $500,000 school bond issue for Alhambra, a proposed $4,000,000 bond issue for the Berkeley schools and $1,000,000 for the San Jose schools. Compton, Los Angeles County, has approved a $675,000 school bond issue.

Sawmill buying of motors and accessories for additions and replacements, which has languished materially for a month or more, is reported on the increase by jobbers in the Puget Sound district. The City of Tacoma on May 27 opened bids for approximately $250,000 worth of cement for the Lake Cushman hydro-electric dam, unit No. 2, and awarded contracts for one two-unit motor-generator set, costing approximately $12,000, and for about $11,000 worth of fire alarm cable. The construction plans of the Pacific Telephone

& Telegraph Company in Seattle during the next five years provide for the expenditure of between $2,000,000 and $3,000,000 annually in extending, improving and replacing telephone facilities. The City of Bremerton, Wash., on June 12 will vote on a $750,000 issue to finance the municipal power and water system. Immediate extensions planned by the Rainier Pulp & Paper Company and the Hoquiam Pulp & Manufacturing Company at Shelton and Hoquiam, Wash., respectively, involve motors and electrical apparatus for which specifications are reported being written. Construction projects are as follows:

The Southern California Edison Company, Los Angeles, plans a power substation at Torrence, Calif., to cost $500,000. The Perfect Caster Manufacturing Company, Los Angeles, will build a plant to cost $100,000. The Pickwick Stages Nite Coach Company, Los Angeles, plans a stage coach manufacturing plant at Inglewood, Calif., to cost $100,000. The William Volker Company, San Francisco, will build an addition to its window shade manufacturing plant to cost $140,000. The Simon Mattress Manufacturing Company, San Francisco, plans an addition to cost $100,000. The Standard Paper Box Company, Los Angeles, plans a factory to cost $200,000. The Modern Furniture Company, Los Angeles, plans an addition to cost $90,000. The California-Oregon Power Company, Medford, Ore., plans a transmission line from Dixonville to Marshfield, Ore. The Presto-O-Lite Company, Portland, Ore., will build an acetylene gas plant to cost $80,000.

Most Sections of Middle West Report Good Business

Good business continues in most sections of the Middle West. The major activities, steel, railroad, agricultural and automotive industries, are in a prosperous condition with every indication of a continuance of this condition. The equipment purchases by the various railroads are substantially heavy. The utility companies are unusually busy with line extension and rehabilitation work. Interesting orders that have been placed include one for a carload of copper busbar, 50 25-kva., single-phase pole type distribution transformers and several construction orders aggregating $100,000. Jobbers' sales are holding up well. The increased activity in the building trades, together with industrial business, is resulting in good business for the jobber. Construction projects are as follows:

The American Lace Paper Company, Milwaukee, Wis., contemplates an addition to cost $600,000. Stoughton, Wis., plans an ornamental lighting system. The Detroit Edison Company, Detroit, plans a power substation at Trenton, Mich., to cost $100,000. Lowell, Mich., has voted bonds for $65,000 for a power dam for its municipal station. The Federal Screw Company, Detroit, will build an addition to cost $75,000. The "Illinois State Journal," Springfield, Ill., will build a printing and publishing plant to cost $225,000. The Willis Motors Corporation, Chicago, plans an automobile plant near Bensenville, Ill., to cost $1,000,000. The Jacob Friedlander Furniture Company, Chicago Heights, Ill., plans a factory to cost $120,000. The Quality Hardware & Machine Corporation, Chicago, will build an addition to cost $65,000. The Thomas Engineering & Manufacturing Company, St. Charles, Ill., will build an addition to its electric coil manufacturing plant to cost $60,000. The Proctor & Gamble Company, Cincinnati, Ohio, plans an addition to its soap manufacturing plant at Kansas City, Kan., to cost $200,000. Lakota, N. D., is arranging a fund of $30,000, for a municipal electric light and power plant. The Minneapolis - Honeywell Regulator Company, Minneapolis, Minn., plans extensions in its heating equipment manufacturing plant to cost $275,000. The University of Nebraska, Lincoln, Neb., plans a central power house to cost $400,000. The Nebraska Power Company, Omaha, Neb., plans a hydro-electric power development at Spalding, Neb., to cost $160,000.

Southeast Reports Sharp Rise in Equipment Orders

Activities in the Southeast reflected better business than for several weeks past and this pick-up was noticeable in both central-station and industrial lines. One company in Georgia ordered oil circuit breakers amounting to $50,000, while another order from that state was for insulators totaling $25,000. Substation equipment aggregating $25,000 was ordered by a Louisiana power company, while a Georgia company purchased similar equipment to the extent of $8,000. Another order was for 100,000 lb. of weatherproof and bare copper wire. Some of the smaller orders were for breaker equipment costing $7,500 and pole line construction materials amounting to $4,500. An order was received from the Birmingham district for mine locomotive equipment amounting to $25,000 and a tire fabric manufacturing plant in Georgia was responsible for an order for wiring supplies totaling $15,000. Gin motor business in Mississippi and Louisiana is looking up, one manufacturer's orders for this equipment in that territory amounting to more than $5,000. A contract will be let within the next few weeks on a yarn mill in Mississippi which will require 1,000 hp. in motors and $7,500 in wiring supplies. In connection with central-station merchandising activities it is interesting to note two campaigns recently completed in which 1,107 electric ranges were sold in Alabama and 401 electric refrigerators, in Mississippi. Construction projects are as follows:

Roanoke, Va., contemplates a floodlighting system and beacon lamps for its municipal airport, the project to cost $100,000. The Duke Power Company, Charlotte, N. C., plans extensions in the transmission lines to Westfield, N. C., and vicinity, with substation facilities. The Rock Hill Finishing Company, Rock Hill, S. C., will build an addition to its textile mill to cost $400,000. Belzoni, Miss., plans extensions in its municipal power plant. Clarksdale, Miss., has rejected bids received for a turbo-generator and other equipment for its municipal power plant and will ask for new bids at an early date. Hattiesburg, Miss., contemplates a floodlighting system and beacon lamps for its municipal airport. The Greater Miami Brick Company, Miami, Fla., plans a plant to cost $80,000. The Public Utilities Commission, Orlando, Fla., plans a power substation to cost $200,000.

Appliance and Fan Sales Good in St. Louis District

The general condition of business in most electrical lines has continued quiet in the St. Louis district. Appliances and fans, however, are going splendidly. The orders of contract size reported are as follows: Two electric locomotives for an Illinois coal company costing $25,000, 1,000 small motors for a manufacturing company in the West costing $20,000, several switchboards for a gas pipe line company costing $20,000, a 500-kw. generator for Diesel connection costing $4,000 and a lot of high-tension disconnecting switches costing $4,000. Construction projects are as follows:

Muskogee, Okla., contemplates a floodlighting system and beacon lamps for its municipal airport, the project to cost $200,000. The Frederick Compress Company, Altus, Okla., plans a cotton compress plant to cost $100,000. The MacMillan Petroleum Products Company, El Dorado, Ark., contemplates an oil refining plant to cost $200,000. The Rio Grande Oil Company, El Paso, Tex., will build an addition to its oil refining plant to cost $800,000. The Dallas Milk Company, Dallas, Tex., plans a cold storage and refrigerating plant to cost $40,000. The Fort Worth Power & Light Company, Fort Worth, Tex., plans an underground conduit system for light and power service to cost $350,000. Nocona, Tex., plans an ornamental lighting system. Lockney, Tex., plans a municipal electric power plant to cost $40,000. The Hughes Tool Company, Houston, Tex., will build an addition to cost $100,000. The University of Texas, Austin, Tex., is asking for bids until June 8 for a mechanical engineering laboratory to cost $175,000. The Humble Oil & Refining Company, Houston, Tex., will build a storage and distributing plant at Corpus Christi, Tex., to cost $100,000. New Orleans, La., plans a floodlighting system and beacon lamps at its municipal airport to cost $600,000. The International Gas Products, Inc., Monroe, La., will build two carbon black plants and a gasoline refinery to cost $400,000.

Metal Prices Hold Firm in Continued Quiet Market

The ninth week of inactivity in the metal markets closes with prices no lower than they were over a month ago in spite of violent declines in some other commodity prices, such as wheat, and a major break in the stock market.

NEW YORK METAL MARKET PRICES

	May 22, 1929 Cents per Pound	May 29, 1929 Cents per Pound
Copper, electrolytic	18	18
Lead, Am. S. & R. price	7.00	7.00
Antimony	8.875	8.95
Nickel, ingot	35	35
Zinc, spot	6.95	6.975
Tin, Straits	43.75	43.50
Aluminum, 99 per cent	24.30	24.30

Base copper wire price May 29, 1929, 19¾ cents

Activities of the Trade

Western Electric Buys Ford Plant

Announcement was made this week by Edgar S. Bloom, president of the Western Electric Company, that in order to provide for future growth his company had contracted to purchase the Ford assembly plant at Kearny, N. J.

It is understood that Western Electric has not yet taken title to any of the property, which comprises about 85 acres adjacent to its New Jersey factory. It is probable that the tract lying to the north of the Western Electric Kearny works—some 20 acres—will be taken over by the Western Electric within the next 30 days. The remaining 65 acres of property will probably not be conveyed to Western Electric before a year has elapsed.

Provision Made to Aid Soviet Electrical Development

Referring to a "technical assistance agreement" recently signed between the Amtorg Trading Corporation and the International General Electric Company, Saul G. Bron, chairman of the board of directors of the Amtorg Trading Corporation, and H. H. Dewey, vice-president of the International General Electric Company, made the following statement:

A close relationship between the electrical industry of the United States and of the Soviet Union will be established with the coming into force of a recently consummated technical assistance agreement concluded between the International General Electric Company and the Soviet State Electrotechnical Trust, and ratified by the Soviet authorities on May 24, 1929. The contract, which will become effective July 1, 1929, provides for a broad exchange of patents, as well as exchange of designing, engineering and manufacturing information between the two organizations, for a period of ten years.

American engineers will be sent to the Soviet Union to assist the Soviet Electrotechnical Trust in carrying out its plans of expansion of the electrical industry in all its phases. The engineering assistance to be rendered by the International General Electric Company will involve the construction of electrical apparatus and machinery for use in electric lighting, the generation and transmission of power and its application to industry.

Soviet engineers will visit this country to study American methods employed in the manufacture of electrical machinery and equipment.

The Soviet electrical industry has registered great progress during the past few years. The electrotechnical factories of the Soviet Union had an output valued at 190,000,000 rubles, at pre-war prices, last year in comparison with 80,000,000 rubles in 1913. During the past four years production of electrical equipment in the U. S. S. R. has nearly trebled. According to the five-year plan of development of the Soviet electrotechnical industry a score of new factories will be constructed, involving an outlay for these enterprises and for additions to existing factories of about $85,000,000.

Electric power production in the U. S. S. R. amounted to 5,500,000,000 kw.-hr. last year, as against less than 2,000,000,000 kw.-hr. in 1913. With the completion of the twoscore power plants now under construction, power production in the Soviet Union will reach 20,000,000,000 kw.-hr. by 1933.

Allis-Chalmers Gets Contract for Waukegan Station

The Allis-Chalmers Manufacturing Company, Milwaukee, has received a contract covering the equipment for the extension of the Waukegan generating station of the Public Service Company of Northern Illinois, including a 65,000-kw. tandem steam turbine unit with condenser, circulating water and condensate pumps. Sargent & Lundy, Inc., are the engineers.

This is the fourth unit for this station. The first was rated at 25,000 kw. and was installed in 1923. A 35,000-kw. unit was installed in 1925 and a 50,000-kw. in 1927, all of the Allis-Chalmers make. Unit No. 4 will be rated at 65,000 kw., is tandem compound with one generator and will be similar to the 50,000-kw. unit except that it will be arranged for boiler reheat.

Claude Neon Plans to Combine Thirty Units

The thirty companies manufacturing Claude Neon lights in North America will soon become consolidated, it was stated by R. L. Kester, vice-president and managing director Claude Neon Lights, Inc., New York, the leading company of the group. The proposed consolidation will include 24 companies and factory units in the United States, five in Canada and one in Cuba. Their total sales volume in 1928 was more than $18,000,000. Similar plans also are under way by the parent company in Paris, France, for the consolidation of the Claude interests in Europe, Asia and South America, under one active directing head in Paris.

The Kelvinator Corporation, Detroit, announces that Charles C. Thomas has joined the engineering staff of its corporation. Mr. Thomas was formerly in charge of engineering for Copeland Products, Inc., Detroit.

The Hamilton Watch Company, Lancaster, Pa., and the Sangamo Electric Company, Springfield, Ill., have formed a new company, the Hamilton-Sangamo Corporation, in which the electric clock business of the Hamilton and Sangamo interests will be concentrated. The product will be known as the Hamilton-Sangamo electrically wound clock and for the present the new corporation will have space in the Hamilton plant.

The Electric Vacuum Cleaner Company, Inc., Cleveland, manufacturer of "Premier" electric cleaners, announces that increased production has necessitated another large addition to its plant. The "Premier" factory group now comprises a main manufacturing building with over 115,000 sq.ft. of floor space, an adjoining office building, three separate units and a large aluminum foundry.

The J. Leo Scanlon Company, 50 Church Street, New York City, sales engineer, announces that John J. Herrity is now associated with its company as a sales engineer. Mr. Herrity has spent approximately five years in the sales department of the Westinghouse Electric & Manufacturing Company of East Pittsburgh, Pa.

The Allis-Chalmers Manufacturing Company, Milwaukee, has received a contract from the Milwaukee Electric Railway & Light Company for a steam turbine unit to be installed in its Lakeside power station, at St. Francis, near Milwaukee. This unit is rated at 60,000 kw. and will be of the straight-reaction, single-cylinder, single-generator type, with direct-connected exciter. The turbine unit will be manufactured at the West Allis works of the Allis-Chalmers Manufacturing Company and the equipment is to be installed ready for operation by September, 1930.

Cramp-Morris Industrials, Inc., Philadelphia, and its subsidiaries, comprising the Cramp Brass & Iron Foundries Company, Federal Steel Foundry Company, I. P. Morris & De La Vergne, Inc., and Pelton Water Wheel Company, announces the change of its New York City address from 100 Broadway to 33 Rector Street.

The Pennsylvania Pump & Compressor Company, Easton, Pa., announces the appointment of Carpenter & Byrne, 4 Smithfield Street, Pittsburgh, as its sales representatives in the Pittsburgh district.

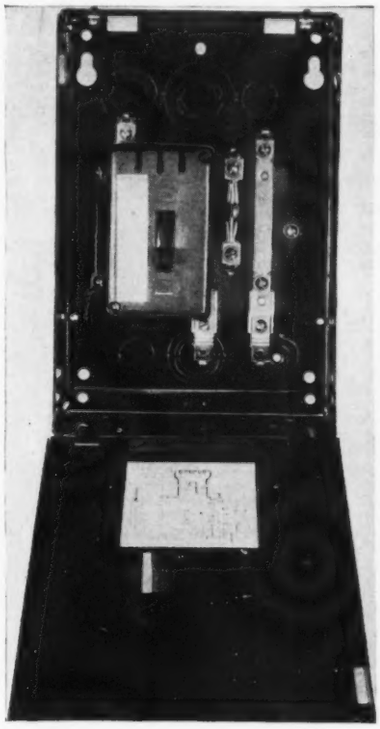
The MacGillis & Gibbs Company, Milwaukee, producer of white cedar poles and posts and Western red cedar poles, announces that Charles M. Sporely has been appointed sales representative in charge of its Chicago office with headquarters at 613 Railway Exchange Building, 80 East Jackson Boulevard, succeeding B. J. Libbe, who has resigned.

The Leonard Refrigerator Company, Grand Rapids, Mich., announces the appointment of Paul H. Puffer to be the head of its mechanical refrigeration cabinet department, a division of the Leonard sales department. Mr. Puffer was formerly vice-president of the Puffer-Hubbard Company of Minneapolis, Minn.

New Equipment Available

Meter Service Breaker with Test Facilities

A meter service breaker which performs equally well on alternating or direct current and is independent of frequency is announced by the Westinghouse Electric & Manufacturing



Company under the trade designation WK-50. The breaker style is 502700 with end wall style K-62675. The breaker itself is small, compact and not limited in its application for entrance work except by the current and voltage rating. It is of the 30-amp., 125-volt, two-wire type.

Manual operation is provided with a handle operating from the front, allowing for close banking or recessing in a wall. The handle is of insulated material so that no amount of arcing can make it alive. Meter testing facilities of the knife switch type are provided when desired. A neutral strap with four terminal screws is provided on the base. All connections and arrangements of parts are practically identical with the present fusible switches and the connections are easily discernible to the wire men.

The tripping mechanism consists of a hardened steel latch which is not used during manual operation, but only when the breaker opens from overload.

Fabricated Terminal Boards Aid Switchboard Wiring

A fabricated terminal board recommended in cases where a large amount of small wiring is used on the back of a panel is announced by the General Electric Company. It consists of a number of terminal blocks separated by suitable barriers assembled on rods with end lugs for mounting and white marking strips to enable each circuit to be identified.

By reason of the fabricated assembly any practical number of poles can be built into a single unit. The standard sizes are 4, 8, 12, 15, 18, 24, 30 38 poles. A greater number of poles can be assembled by using longer rods and marking strips and additional barriers.

"Quartap" Provides Four Leads from Outlet

An addition to its line of genuine Bakelite electrical conveniences is announced by the Connecticut Electric Manufacturing Company, Bridgeport, Conn. The new device, called the "Quartap," provides for four leads from a single outlet. It is provided with a silk-covered cord to which is attached a regular attachment plug cap. This allows the body of the device to be conveniently placed on the table or other piece of furniture where it is handy for plugging in or removing the plug without reaching or stooping.

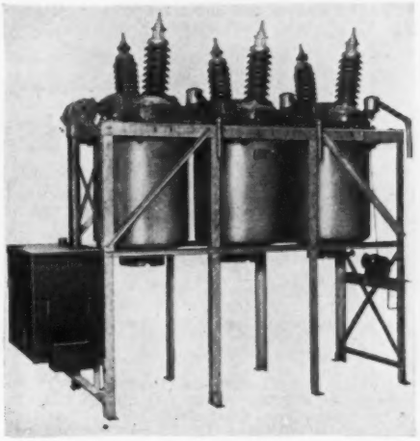
The product is round in shape and about 3½ in. in diameter by ⅝ in. high. The bottom face has four rubber feet to prevent slipping or skidding and marring polished surfaces. All connections and metal parts are concealed, making it shockproof and easy to keep clean.

Oil Circuit Breakers Have Special Oil Retractors

A new line of outdoor oil circuit breakers in voltages from 37 kv. to 73 kv., inclusive, is announced by the Delta-Star Electric Company, Chicago. Reliability and ruggedness to withstand repeated punishment has been the keynote throughout the entire design.

They are of the double gas isolated type with special oil retractors to prevent oil throw. Among the noteworthy points are high flashover, bushings of the oil or compound type, multiple ratio current transformers, hot-dipped galvanized support frames, gas and oil proof terminal blocks and a closing mechanism of the trip-free, any-position type.

A thorough oscillographic study given

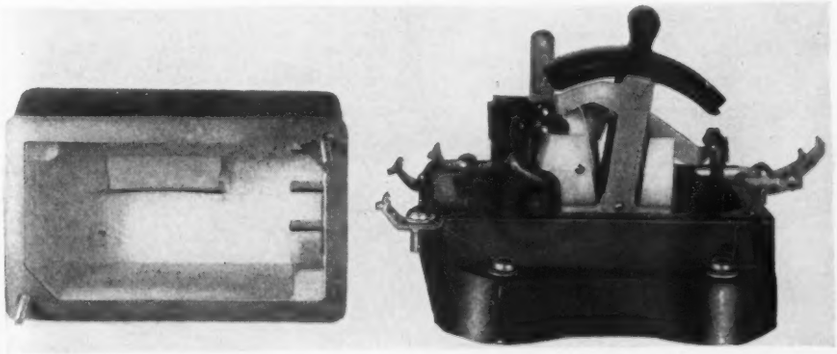


to the relief of dynamic stresses of the moving parts resulted, it is claimed, in a breaker having a maximum contact velocity with minimum dynamic stresses and with safety factors for these moving mechanical parts far in excess of that generally considered satisfactory. Special steel alloys having shock and fatigue resisting qualities are used throughout.

Wire Connector Needs No Solder or Tape

A new type of wire connector, which is known as "Fixture Universal" connector, is announced by the Ideal Commutator Dresser Company, Sycamore, Ill. It is of the same style as the company's other types and requires no solder or tape.

The new "Fixture Universal" connector is adapted for combinations of wires as follows: Two No. 18 stranded or solid wires, three No. 18 stranded, four No. 18 stranded and five No. 18 stranded, or equivalent combinations. The connector has been especially adapted for fixture assembly work, installing of fixtures and installing of any electrical device requiring the making of joints in the above wire sizes.



Electrical Patents

Announced by U. S. Patent Office

(Issued May 14, 1929)

1,713,182. PROTECTIVE ARRANGEMENT; L. F. Kennedy, Schenectady, N. Y. App. filed March 20, 1928.

1,713,183. IGNITION COIL; C. H. Kindl, Dayton, Ohio. App. filed June 22, 1927.

1,713,188. SYSTEM OF SHIP PROPULSION; C. MacMillan, Schenectady, N. Y. App. filed March 10, 1923.

1,713,199. ELECTRIC SWITCH; H. B. Trott, McKeesport, Pa. App. filed June 18, 1928.

1,713,201. QUICK-ACTION ELECTRIC SWITCH; A. J. Veall, South Yarra, Victoria, Australia. App. filed March 9, 1926.

1,713,202. MOTOR-PROTECTIVE-SWITCHING APPARATUS; E. E. Warner, Schenectady, N. Y. App. filed July 1, 1925.

1,713,203. CENTRIFUGAL SWITCH; A. F. Welch, Fort Wayne, Ind. App. filed Oct. 5, 1927.

1,713,208. CONTROL SYSTEM; J. Yuyama, Ebaragun, Tokyofu, Japan. App. filed June 19, 1928.

1,713,209. AUTOMATIC RECLOSING CIRCUIT-BREAKER SYSTEM; A. E. Anderson, Scotia, N. Y. App. filed June 27, 1927.

1,713,214. TRANSFORMER; F. F. Brand, Pittsfield, Mass. App. filed July 11, 1928.

1,713,215. SERIES STREET-LIGHTING SOCKET; H. E. Butler, Scotia, N. Y. App. filed Dec. 11, 1925.

1,713,223. MAGNETIC CIRCUIT CONTROLLER; H. V. Green, Chicago, Ill. App. filed June 23, 1926.

1,713,226. HIGH-SPEED GRAPHIC RECORDER; C. I. Hall, Fort Wayne, Ind. App. filed Jan. 16, 1925.

1,713,228. CONTROL OF BRAKING EFFECT; E. D. Harrington, Schenectady, N. Y. App. filed Aug. 31, 1927.

1,713,229. CIRCUIT INTERRUPTER; E. M. Hewlett, Schenectady, N. Y. App. filed Aug. 16, 1926.

1,713,249. ELECTRIC HEATER; C. C. Abbott, and W. F. Gelinas, Pittsfield, Mass. App. filed Nov. 27, 1925.

1,713,276. ELECTRICAL TIME-RECORDING SYSTEM; F. E. Goeckler, Philadelphia, Pa. App. filed Dec. 29, 1926.

1,713,290. SWITCH-CONTROLLING DEVICE; F. E. Lumley, Chicago, Ill. App. filed March 25, 1927.

1,713,302. ORNAMENTAL CONDUCTOR FOR ELECTRIC WIRES; R. C. Schemmel, Union City, Ind. App. filed June 27, 1928.

1,713,303. BROILER; L. W. Serrell, New York, N. Y. App. filed Feb. 1, 1928.

1,713,304. REVERSING SWITCH; O. F. Shepard, Cincinnati. App. filed Dec. 13, 1923.

1,713,426. INSULATOR; R. S. Drake and C. S. Drake, Placerville, Calif. App. filed March 19, 1928.

1,713,444. PORTABLE ELECTRIC TOOL-DRIVING MACHINE; P. J. Moore, Butte, Mont. App. filed May 29, 1928.

1,713,460. CIRCUIT CLOSER; L. C. Wood, Greensboro, N. C. App. filed July 23, 1924.

(Issued May 21, 1929)

17,296 (reissue). HOLLOW CONDUCTOR; W. H. Bassett, Cheshire, Conn. App. filed Oct. 3, 1924.

1,713,509. SOCKET ARM FOR LIGHT-REFLECTING SHADES; M. B. Bowen, Decatur, Ill. App. filed Aug. 6, 1928.

1,713,514. PROCESS OF ELECTROLYTICALLY SEPARATING METALLIC CHROMIUM FOR THE PRODUCTION OF CHROMIUM COATINGS ON OTHER METALS; R. Appel, Berlin, Germany. App. filed Aug. 3, 1926.

1,713,526. ELECTRICAL-CIRCUIT FITTING; O. A. Frederickson, Wethersfield, Conn. App. filed May 27, 1926.

1,713,559. CONTROLLER; J. E. Sederholm, St. Paul, Minn. App. filed Feb. 9, 1927.

1,713,578. THERMOSTATIC CONTROL FOR ELECTRICALLY-HEATED APPARATUS; A. E. Whittier, Bristol, Conn. App. filed Dec. 9, 1927.

1,713,610. SHORT-CIRCUITING DEVICE FOR MOTORS; G. H. Leland, Dayton, Ohio. App. filed Nov. 2, 1925.

1,713,617. ELECTRIC MOTOR; A. E. Oswald, Bogota, N. J. App. filed Dec. 13, 1922.

1,713,629. OPERATING MEANS FOR CIRCUIT CONTROLLING MECHANISM; W. M. Scott, Tredyffrin Township, Chester Co., Pa. App. filed Dec. 16, 1926.

1,713,649. APPARATUS FOR GENERATING ELECTRIC ENERGY; W. D. Fletcher, West New Brighton, N. Y. App. filed Sept. 17, 1926.

1,713,697. STABILIZING REACTANCE; J. E. Granger, Alhambra, Calif. App. filed Aug. 11, 1927.

1,713,698. RELAY SYSTEM; W. G. Hickling, Johnstown, Pa. App. filed Oct. 15, 1923.

1,713,716. INSULATED CONDUCTOR; H. D. Saylor, Newark, N. J. App. filed Oct. 28, 1924.

1,713,735. TERMINAL CONNECTER; E. L. Benson, New London, Conn. App. filed Feb. 3, 1926.

1,713,752. ELECTRIC INCANDESCENT LAMP; F. Eckhardt and M. Hohnekamp, Eisenach, Germany. App. filed May 5, 1927.

1,713,773. AUTOMATIC SAFETY SWITCH; R. F. Metcalfe, Brooklyn, N. Y. App. filed May 14, 1925.

1,713,777. MOTOR CONTROLLER; N. L. Mortensen, Whitefish Bay, Wis. App. filed Nov. 10, 1926.

1,713,825. PROCESS OF MANUFACTURING SECONDARY-BATTERY PLATES; F. Garaca, Bessemer, Ala. App. filed Nov. 18, 1927.

1,713,845. ELECTRIC SOLDERING IRON; E. A. Lockwood, Royal Oak, Mich. App. filed Nov. 22, 1926.

1,713,850. ELECTRICAL INDICATING INSTRUMENT AND SYSTEM OF CONTROL THEREFOR; W. McCoy, Cleveland, Ohio. App. filed Jan. 8, 1925.

1,713,867. ELECTRICAL CONDENSER; W. Dubilier, New York, N. Y. App. filed March 1, 1924.

1,713,883. TIMING AND DISTRIBUTING DEVICE; D. Shay, Spokane, Wash. App. filed March 8, 1926.

1,713,912. RAIL BOND; F. H. Neff, South Euclid, Ohio. App. filed April 12, 1928.

1,713,916. MOTOR-CONTROL DEVICE; C. C. Parrish, Donora, Pa. App. filed Dec. 15, 1926.

1,713,929. AUTOMATIC PROJECTOR LAMP; E. A. Sperry, Jr., Brooklyn, N. Y. App. filed Jan. 26, 1921.

1,713,931. CIRCUIT CONTROLLER; W. C. Stevens, Milwaukee, Wis. App. filed April 29, 1927.

1,713,941. METHOD OF WINDING COILS; A. H. Adams and C. H. Franks, La Grange, Ill. App. filed Oct. 29, 1927.

1,714,003. ADJUSTABLE LAMP FIXTURE; M. F. Deach, Oakland, Calif. App. filed May 31, 1927.

1,714,012. PIEZO-ELECTRIC OSCILLATOR; A. J. R. Fiego, Lynn, Mass. App. filed April 15, 1926.

1,714,020. TWO-CIRCUIT MASTER ELECTROLIER INDICATING SNAP SWITCH; W. G. Grover, Weed, Calif. App. filed Dec. 11, 1926.

1,714,065. ELECTRICAL INDICATING INSTRUMENT; E. F. Weston, Newark, N. J. App. filed Sept. 16, 1927.

1,714,071. PROTECTIVE APPARATUS FOR ALTERNATING-CURRENT ELECTRIC CIRCUITS; R. W. Biles, Balcombe, England. App. filed June 23, 1926.

1,714,074. SAFETY RAILWAY GATE; J. F. Burch and A. H. Morton, Billings, Mont. App. filed March 26, 1927.

1,714,077. BATTERY TERMINAL; A. M. Clark, Cincinnati, Ohio. App. filed Feb. 20, 1926.

1,714,081. ELECTRIC FURNACE; F. A. Fitz Gerald, Niagara Falls, N. Y. App. filed May 26, 1925.

1,714,085. ELECTROMAGNETIC SWITCH; B. E. Getchell, Plainville, Conn. App. filed Sept. 22, 1927.

1,714,086. ELECTRIC SWITCH; B. E. Getchell, Plainville, Conn. App. filed Sept. 22, 1927.

1,714,147. WAX-HEATING AND SEALING DEVICE; J. Weisbarth, Madison Township, Richland Co., Ohio. App. filed March 21, 1928.

1,714,167. COMBINATION COOLING FAN AND HEATER; R. S. Hardin, Chicago, Ill. App. filed Oct. 22, 1928.

1,714,175. ELECTRIC COOKING PLATE; R. H. MacInnes, Chicago, Ill. App. filed Aug. 29, 1927.

1,714,191. ELECTRICAL CONDENSER; S. Ruben, New York, N. Y. App. filed Dec. 22, 1926.

1,714,202. ELECTRICAL INDICATING INSTRUMENT; E. F. Weston, Newark, N. J. App. filed Sept. 6, 1927.

1,714,242. REFLECTOR ARC; L. del Riccio, New York, N. Y. App. filed April 19, 1927.

1,714,255. LIGHTNING ARRESTER; A. L. Atherton, Penn Township, Allegheny Co., Pa. App. filed Feb. 7, 1927.

1,714,285. ELEVATOR CONTROL; E. B. Thurston, Toledo, Ohio. App. filed July 31, 1926.

1,714,319. ELECTROSTATIC CONDENSER; S. Ruben, New York, N. Y. App. filed Aug. 22, 1927.

1,714,321. MOTOR AND MOTOR SWITCH FOR FLASHERS AND THE LIKE; S. H. Sharpsteen, Tenafly, N. J. App. filed Oct. 28, 1924.

1,714,336. ELECTROMAGNET; E. E. Yaxley, Chicago, Ill. App. filed May 6, 1927.

Information on foreign patents can be obtained through the nearest district office of the Bureau of Foreign and Domestic Commerce, Department of Commerce.

New Trade Literature

COLOR LIGHTING EQUIPMENT.—The Reynolds Electric Company, 2658 West Congress Street, Chicago, has issued bulletin No. 77 covering the "Reco" color lighting equipment for the theater, cove lighting, floodlighting, sign lighting, interior lighting, show window lighting, street lighting and for other general lighting needs.

SWITCHES.—The Champion Switch Company, Kenova, W. Va., is distributing bulletin E, describing and giving engineering data on its outdoor disconnect switches of from 400 to 3,000 amp. for various commercial voltages.

OIL CIRCUIT BREAKERS.—The Roller-Smith Company, 233 Broadway, New York City, has issued bulletin No. 600 covering its type O, classes 11, 12 and 13 indoor oil circuit breakers.

STREET LIGHTING CONTROL AND WASTE PREVENTION.—Circular No. 1757-B issued by the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., covers the Westinghouse resonant control for street lights. The company also has published a booklet entitled "A Campaign to Prevent Waste," in which it tells in a pictorial way the methods and the procedure employed by the company in the campaigns it has conducted against waste within its organization.

HOSPITAL SIGNALING DEVICES.—Edwards & Company, Inc., 140th and Exterior Streets, New York City, has issued bulletin No. 16, "Modern Hospital Signaling," in which it describes and illustrates hospital signaling equipment. It contains information on nurses' call equipment, doctors' paging systems, doctors "in" and "out" systems, nurses' home return call system, maids' or nurses' location system, watchman's time detectors, telephones, fire alarm and tank alarm systems. Illustrations, wiring diagrams and conduit layouts also are included.

PROTECTIVE COATINGS.—Bulletin No. 1170 issued by the Dampney Company of America, Hyde Park, Boston, describes and illustrates the various types of power plant equipment to which "Apexior" coatings are applied for the prevention of pitting and corrosion. The bulletin also illustrates the equipment that the company has perfected for applying these coatings quickly and uniformly to the internal surfaces of bent and straight boiler and economizer tubes.

LIGHTNING ARRESTERS.—The Electric Service Supplies Company, Seventeenth and Cambria Streets, Philadelphia, is distributing booklet No. 268 entitled "Crystallite," the sixth of a series describing the technical features of the crystal valve lightning arrester as they apply to modern lightning protection.

Foreign Trade Opportunities

Following are listed opportunities to enter foreign markets. Where the item is numbered, further information can be obtained from the Bureau of Foreign and Domestic Commerce, Washington, by mentioning the number:

An agency is desired in London, England (No. 38,589), for automobile electrical equipment and another (No. 38,674), for household electrical appliances.

Purchase is desired in Hobart, Australia (No. 38,668), of a floor-surfacing machine.

Purchase or agency is desired in Sheffield, England (No. 38,675), for electric heaters for railway cars.

Purchase and agency are desired in Barcelona, Spain (No. 38,669), for household electrical appliances and electric refrigerators.

An agency is desired in Calgary, Canada (No. 38,670), for household electrical appliances especially vacuum cleaners, also for electric refrigerators.

An agency is desired in Montreal, Canada (No. 38,676), for electrical indicating instruments, oil switches and circuit breakers and another (No 38,667), for lighting fixtures, wiring devices and electrical insulating materials.

Purchase is desired in Kamloops, Canada (No. 38,620), of electric paint sprayers and spraying attachments for vacuum cleaners.

Purchase is desired in Smyrna, Turkey (No. 38,593), of electric refrigerators.

Business Facts for Electrical Men

Selected Statistics Presented Graphically for the Use of All Interested in Analyzing the Trend of the Electrical Business

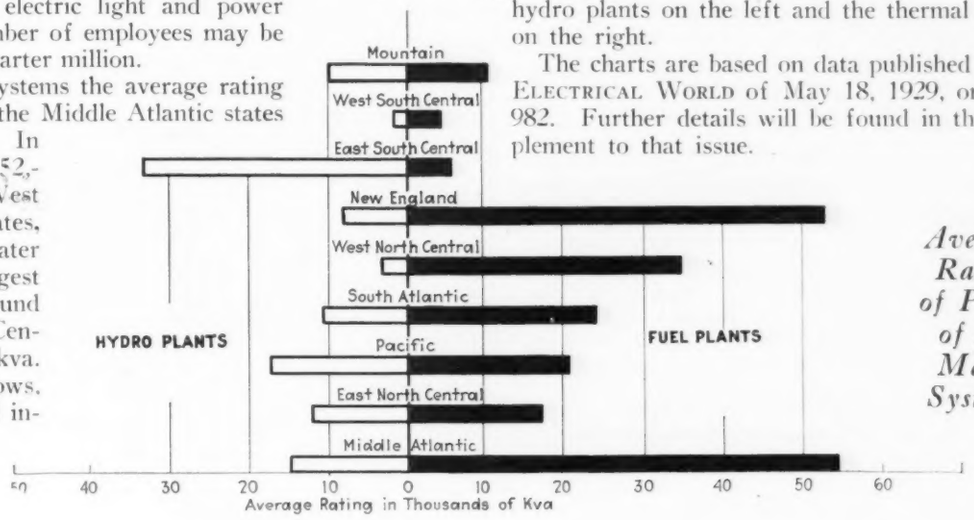
Steam Plants Average Larger than Hydro

THE mass of mechanical equipment in American power plants may be inferred from the huge average rating of the stations operated by the more important companies. In 1928 there were 134 systems having an output in excess of 100,000,000 kw.-hr. Their aggregate production constituted about 88 per cent of the total for the entire electric light and power industry. Their number of employees may be taken roughly at a quarter million.

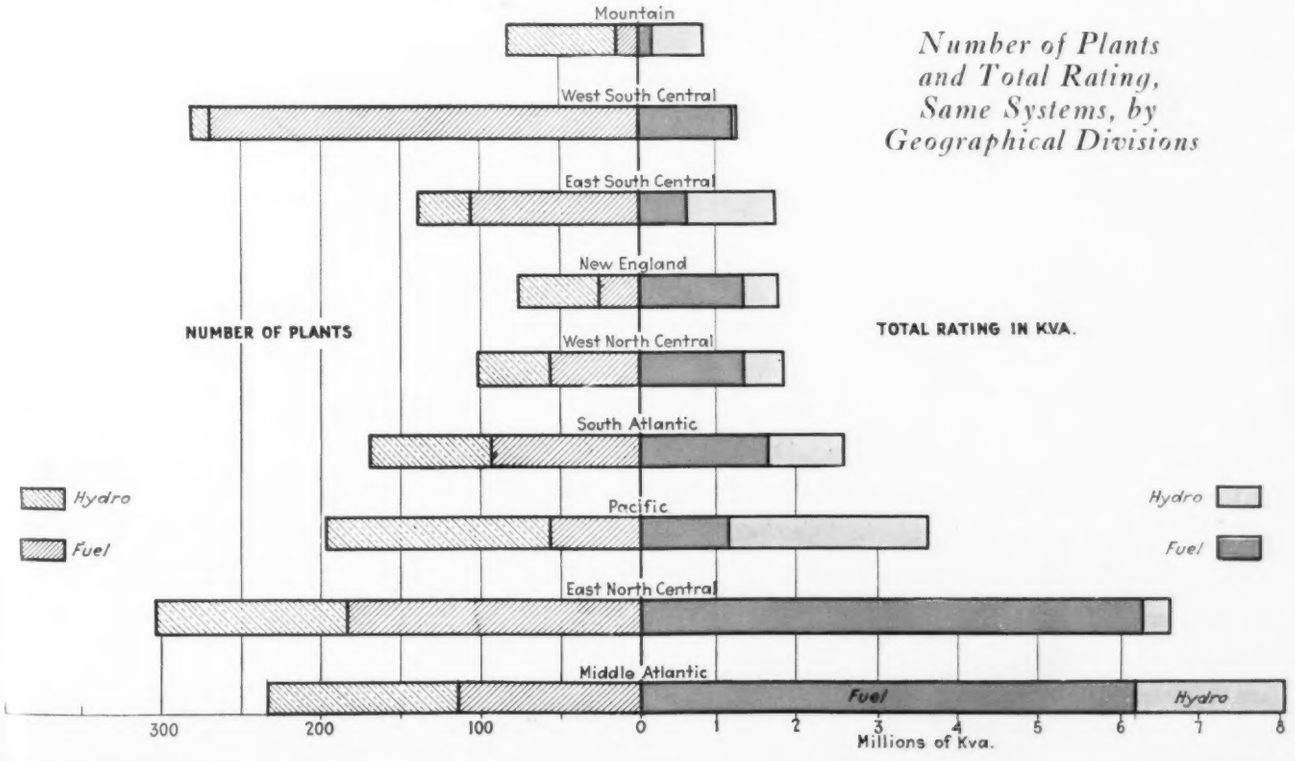
For these major systems the average rating of thermal plants in the Middle Atlantic states is about 54,600 kva. In New England it is 52,800 kva.; in the West North Central states, 34,600 kva. For water power plants the largest average rating is found in the East South Central division, 33,000 kva.

The lower chart shows, at the right, the total installation of the 134 systems under consideration, classified by geographical divisions, arranged in order of plant capacity, and divided between thermal and hydro plants. At the left are the corresponding numbers of plants, the maximum being 302 in the East North Central division. The upper chart shows the regional average rating, the hydro plants on the left and the thermal plants on the right.

The charts are based on data published in the ELECTRICAL WORLD of May 18, 1929, on page 982. Further details will be found in the supplement to that issue.



Average Rating of Plants of 134 Major Systems



Number of Plants and Total Rating, Same Systems, by Geographical Divisions

Seasonal Recession in New England

A SEASONAL recession of about normal proportions was witnessed in New England manufacturing plants during April. The rate of general productive activity in the section during April was 4.1 per cent under March, but was 10.2 per cent over April last year. The peak and record rate of activity in this section was recorded during February, since which time there has been a continuous drop. There is every reason to believe, however, that the average rate of productive operations during the first six months of the year will be materially over that in the same period last year.

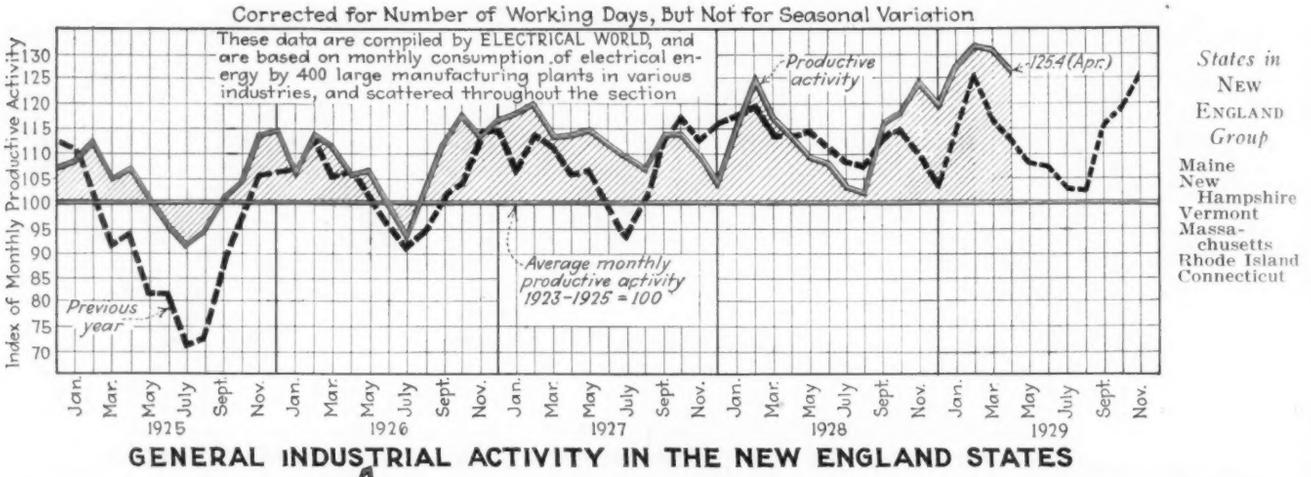
Five of the most important industrial groups of the New England States—rolling mills and steel plants, ferrous and non-ferrous metal-working plants, paper and pulp, rubber products and the textiles industry—reported a rate of operations during April above that of last year. The largest twelve-month gain was recorded by the rolling mills and steel plants with a gain of about 45 per cent, while the textile plants were operating on a plane only about 2.2 per cent above last year. On the other hand, three important industrial groups—chemicals and allied products, leather products, and lumber products—recorded operations materially under last year, the greatest drop in activity being recorded by the lumber products group with a decrease in operations of 19.3 per cent, followed by the leather products group with a drop of 15.2 per cent.

Indexes of Productive Activity in the New England States

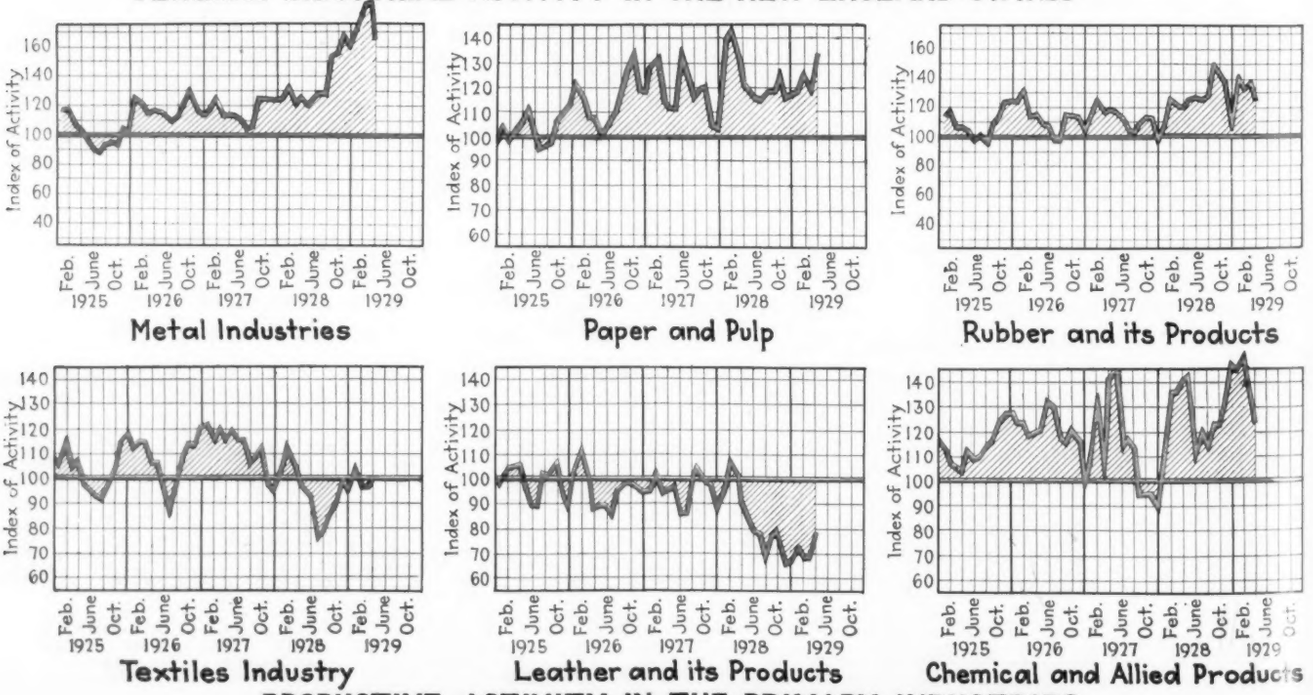
All Figures Adjusted for Number of Working Days

	April, 1929	March, 1929	April, 1928	Average for First Four Months, 1929	Average for First Four Months, 1928
All industry	125.4	130.8	113.8	129.1	120.3
Chemicals and allied products	126.4	133.3	140.2	137.9	132.7
Leather and its products	77.8	68.0	91.7	71.7	99.2
Forest products	94.6	58.7	117.2	93.9	109.9
Metal industries group	164.5	191.7	127.3	178.9	126.7
Rolling mills and steel plants	191.0	230.7	131.7	217.7	.....
Metal-working plants	154.7	176.0	125.6	163.5	.....
Paper and pulp	133.8	118.4	121.2	123.7	134.8
Rubber and its products	125.0	138.2	119.2	133.3	118.1
Textiles	100.4	97.2	98.3	99.3	105.9

ELECTRICAL WORLD *Barometer of Industrial Activity in the New England States*


Corrected for Number of Working Days, But Not for Seasonal Variation
These data are compiled by ELECTRICAL WORLD, and are based on monthly consumption of electrical energy by 400 large manufacturing plants in various industries, and scattered throughout the section
Productive activity
125.4 (Apr.)
Average monthly productive activity 1923-1925 = 100
Previous year
Index of Monthly Productive Activity
States in New England Group
Maine
New Hampshire
Vermont
Massachusetts
Rhode Island
Connecticut
1925
1926
1927
1928
1929

GENERAL INDUSTRIAL ACTIVITY IN THE NEW ENGLAND STATES



PRODUCTIVE ACTIVITY IN THE PRIMARY INDUSTRIES OF THE NEW ENGLAND STATES